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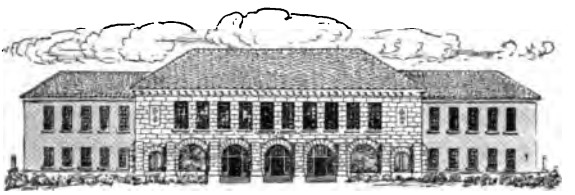

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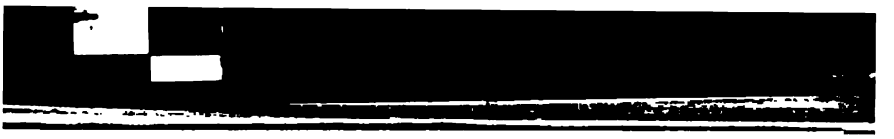

UNIVERSITY PROBLEMS

UNIVERSITY PROBLEMS

IN THE UNITED STATES

BY

DANIEL COIT GILMAN, LL. D.

PRESIDENT OF THE JOHNS HOPKINS UNIVERSITY

NEW YORK

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TO COLLEAGUES, STUDENTS, AND FRIENDS

IN THE UNIVERSITIES OF THE UNITED STATES

AND ESPECIALLY

TO THOSE AMONG WHOM I HAVE DWELT

IN THE EAST, THE WEST, AND THE SOUTH

JOHNS HOPKINS UNIVERSITY,
BALTIMORE, OCTOBER 1, 1898.

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THE JOHNS HOPKINS UNIVERSITY IN ITS BEGINNING

AN INAUGURAL ADDRESS

BALTIMORE, 1876

The Johns Hopkins University was founded by Johns Hopkins, a merchant of Baltimore, who died in December, 1873, and bequeathed the principal part of his fortune for the establishment of a University and a Hospital. The University was opened to scholars in 1876; the Hospital was opened to patients in 1889; the Medical School was fully organized in the autumn of 1893.

The address which follows was delivered by the first president of the University, February 22, 1876.

THE JOHNS HOPKINS UNIVERSITY IN ITS BEGINNING

IF this assembly, with one voice, could utter the thought now uppermost, there would be a deep, quick, hearty acknowledgment of the bounty of Johns Hopkins.

His beneficence, so free, so great, so wise, promoting at once the physical, intellectual, and moral welfare of his fellow-men, awakens universal surprise and admiration, and calls for our perpetual thanks.

In respect to the giver, I can say but little to you, the citizens of Baltimore, who knew him so well; who remember his industry, sagacity, and intellectual force; who have tested his integrity, and found that his word was as good as his bond; who recall his foresight, his enterprise, and his belief in the future of this city and State, who recollect that more than once in financial crises he hazarded his own fortune for the protection of others; who heard, it may be from his own lips, the motives and hopes which prompted these royal gifts; who believe that

great acquisitions involve great responsibilities, but who know how hard it is for one long accustomed to power to yield that power to others: to you, his fellow-citizens, who saw the steps by which this benefactor toiled upward to the temple of Fortune, and there, unsatisfied, went higher, by more arduous steps, to the temple of Charity, where he bestowed his gifts.

While I leave to others the commemoration of our founder, you must let me refer to the tributes of admiration which his generosity has called out on the remotest shores of our own land and in the most venerable shrines of European learning. The Berkeley laurel and the Oxford ivy may well be carved upon his brow when the sculptor shapes his likeness; for by wise men in the East and by rich men in the West his gifts are praised as among the most timely, the most generous, and the noblest ever bestowed by one, for all.

The genesis of American munificence is a bright chapter of our history. From the days of the Puritan minister who gave his name to our oldest university, and the days of the London merchant who endowed the second college in New England, each generation has surpassed its predecessor. It is a striking coincidence that among the very earliest names on this heraldic roll is that which our foundation bears. The schools which Edward Hopkins, a colonial governor, established in 1660, by his will, and his gifts to Harvard, still keep alive his name and influence. So may the name of our founder live for more than two hundred years to

come, and his gifts be immortal. Johns Hopkins might have used the very words of Edward Hopkins, who desired to bestow "some encouragement for the breeding up of hopeful youths for the public service of the country in future times."

We may conjecture a spiritual if not a physical descent in the line of Hopkins. In 1676 the name is written on the door of an endowed grammar school at New Haven, older than Yale, and second only to Harvard; in 1776 the name is signed to the Declaration of Independence; in 1876 it distinguishes a university foundation. To our contemporary we may apply the words with which the deeds of the colonial governor are recounted. After saying that his last will is an interesting monument of private friendship and public spirit, that friends and domestics were not forgotten, that his public gifts were "for the promotion of religion, science, and charity," the historian adds this eulogy: "Thus did this lofty and intellectual spirit devise and distribute blessings in his own age, and by his wisdom prepare and make them perpetual for succeeding times."

The total amount of the public gifts of Johns Hopkins is more than seven million dollars. The sum of $3,500,000 is appropriated to a university, a like sum to a hospital, and the rest to local institutions of education and charity. Let us compare these benefactions with some others. Thirty years ago, when the gift of Abbott Lawrence to Harvard College was made known, it was said to be "the largest amount ever given at one time during the

lifetime of the donor to any public institution in this country,"—the amount was $50,000; the gift of Smithson, so well administered in Washington, amounted to over half a million; the foundation of Stephen Girard surpassed two million dollars.

You may see from these figures what great munificence has brought us together. So far as I can learn, the Hopkins foundation, coming from a single giver, is without a parallel in terms or in amount in this or any other land. But beware of exaggeration. These gifts are often spoken of as if the whole, instead of the half, was intended for the university, and then as if an equal amount was given to the hospital; and so it happens that dreams of monumental structures and splendid piles and munificent salaries flit through the mind, which can never become real. Do not forget how much wealth is accumulated by older colleges—in repute, experience, and influence, and also in material things. The property of Harvard College is more than five million dollars; that of Yale must equal our endowment. The land investments of a university in the Northwest are said to exceed these values; and Ezra Cornell, while he lived, expected that the endowments at Ithaca would approach, if not surpass, the funds of Harvard. The income-yielding funds of Harvard in 1875 were over three millions; those of Yale near a million and a half. Even these figures look small compared with the accumulations of Oxford and Cambridge.

Now turn our capital into income. Our university fund yields a revenue of nearly $200,000. Let

us compare this amount with the resources of our two richest colleges. Harvard, in 1874–75 (in all departments), received from tuition $168,541.72; from property, $218,715.30—a total of $387,257.02. The college alone, not including the library, the general administration, or any of the special departments, cost $187,713.20, which is nearly our whole income. Yale College reports its academical expenses (*i. e.*, exclusive of those in the scientific, theological, law, medical, and art departments), in 1874–75, as $126,073.56.

But all our revenue is not at once available; for, as the capital cannot be spent for buildings, some income must be reserved for this. Of course the buildings will be good and costly. If now we deduct from our income one hundred thousand dollars annually, as a building fund, it will take several years to accumulate the requisite amount. Of that which remains a large sum will be absorbed by taxation, administration, and the purchase of books, instruments, and collections. Thus it is evident that the educational income at present is not large. Its expenditure requires great discretion and prudence. The trustees are men of liberal views in respect to professional salaries, but they see as clearly as a school-boy sees through a problem in short division that the larger the divisor, the less the quotient; the more salary, the less chairs; the more eminent and costly the teachers, the fewer can be secured. I wish that every one who sees the need of a great university, and who knows the range of human science,

would take a pencil and distribute our income among the departments which he would like to see promoted here. If his experience is like mine, he will find that before his pencil has gone halfway down the column of the sciences the income has been twice expended.

I fear that these remarks are a little ungracious, and I would gladly repress them; but the private and public utterances of thoughtful men have been so vague as to what it is possible for the trustees of this university to accomplish at once, and our friends are so very generous in their expectations, that I feel compelled at the very outset to utter a word of caution. If our physicists could bring us "Aladdin's lamp," or our chemists produce "the philosopher's stone," or our merchants give us "the widow's cruse," our aspirations would not be checked by our restricted means; but, till the original benefaction is supplemented by other gifts, or the growth of Baltimore increases the value of our present investments, we must be contented with good work in a limited field.

To many the magnitude of our founder's bounty seems its principal value; that is, in fact, but half its glory. With a self-renunciation which is rare and noble, he attached to the gift no burdensome condition or personal whim. The almoners of his bounty are restrained by no shackles bequeathed by a departed benefactor, as they enter upon their tasks bearing in the one hand the ointment of charity and in the other the lamp of science. His

trustees are free—free to determine principles, to decide upon methods, to distribute income, to select professors, to summon students, and even to alter, from time to time, their own plans, as the enlightenment of the world bestows its radiance upon their undertaking.

In selecting trustees the choice of our founder fell upon some of his friends and acquaintances whom he believed to be free from a desire to promote, in their official action, the special tenets of any denomination or the platform of any political party. In a land where almost every strong institution of learning is either "a child of the church" or "a child of the state," and is thus liable to political or ecclesiastical control, he has planted the germ of a university which will doubtless serve both church and state the better because it is free from the guardianship of either. It was his wish —it is our wish—that here should be a seat of learning so attractive that at its threshold students will gladly cease to discuss sectarian animosities and partizan prejudices, in their eagerness for the acquisition of knowledge and their search for truth. As in the olden time the courtier's and the peasant's sons laid aside their distinctive costumes when they donned the academic "cap and gown," let us hope that here the only badges will be those of the scholar.

Another advantage attends our foundation. It is established in a large town, in an old State, near the financial and the political capitals of the Republic, and at the junction of national highways

which connect the North and the South, the East and the West. Such geographical considerations will surely affect our future. Baltimore, moreover, is prepared for this foundation. Professional schools of law, medicine, and theology already attract large numbers of students. Already, instruction in the useful arts is to some extent provided in the Maryland Institute. The votaries of the natural sciences are associated in an Academy, which needs only an endowment to enable it to take rank with kindred societies elsewhere. The city, with a liberality which is praised at home and abroad, maintains two excellent high schools for young ladies, and for young men a City College, so well organized, so well taught, and so well supported that it may relieve our foundation from much which is called "collegiate" in distinction from "university" work. There are good private schools. There are excellent collections of paintings and rare opportunities for the study of music, both as a science and an art. More than all this, the foundation of George Peabody, in which a capital of a million and a quarter dollars is forever set apart for the promotion of culture, has now, with increasing strength, survived the perils of infancy, and gained a place among the very best establishments to be found in any part of our land. Its library is extraordinary for our country; not because of its size (some sixty thousand volumes), but because it has been selected with an experienced eye from among the most modern and most useful of the publications of the world.

In its Beginning

The advantage which will come to the new university in its medical department from the establishment of a hospital, on a separate but allied foundation, is most obvious. Obvious though it is, the most enlightened cannot overestimate its value. If so large a sum as the hospital fund ($3,500,000) were consecrated under any circumstances to the relief of suffering, the promotion of health, and the preservation of life, humanity would rejoice; but when such a foundation is connected with a university, so that on the one hand it commands all the resources of human learning, and on the other makes known through accomplished teachers the results of its experience, we may confidently expect that its influence for good will be more than doubled; that its immediate work in the care of the sick and wounded will be better done than would otherwise be possible; and that its remedial and preventive agencies will extend to thousands who may never come within its walls, but whose ills will be relieved by those taught here.

The timeliness of our foundation is the last of the advantages which I shall name. We begin our work after discussions lasting for a generation respecting the aims, methods, deficiencies, and possibilities of higher education in this country; after numerous experiments, some with oil in the lamps and some without; after costly ventures of which we reap the lessons, while others bear the loss; after Jefferson, Nott, Wayland, Quincy, Agassiz, Tappan, Mark Hopkins, Woolsey, have

completed their official services and have given us their supreme decisions; while the strong successors of these strong men, Eliot, Porter, Barnard, White, Angell, and McCosh, are still upon the controversial platform. We begin after the national bounty has for fourteen years, under the far-reaching bill of Senator Morrill of Vermont, promoted scientific education; and after scores of wealthy men have bestowed many million dollars for the foundation of new institutions of the highest grade.

Educational discussions and controversies are not restricted to our new country. In old England, questions like these are constantly rife, in addition to many of purely local interest: How may professorships in the old universities be restored to the dignity and influence of which they have been in part deprived by the excessive preponderance of collegiate instruction; how may the university influences be extended to all the large towns; how may science gain a more generous recognition in the ancient seats of learning; how may endowments for research be established without leading to sinecure fellowships; how may ecclesiastical fetters be removed from academic institutions; how may the universities, by their systems of local examinations, best promote the welfare of the preparatory schools, or secure the training of young persons who are not likely to enter the university; how may the universities better provide for the innumerable modern callings which lie outside of the old "professions" but require an equal culture?

In its Beginning

In France, there has not been since the Revolution, I presume, such interest in the promotion of universities as now. I pronounce no opinions, but I call attention to the remarkable law which was passed last year, relinquishing the exclusiveness of a state foundation, and declaring university instruction to be free. Those who have hitherto been oppressed, as they think, by a hard law, now seize with alacrity the opportunity to found new institutions, and the offerings of the faithful are freely poured out to restore to the Roman Catholic Church those intellectual agencies from which she has been cut off.

At a distance, Germany seems the one country where educational problems are determined; not so, on a nearer look. The thoroughness of the German mind, its desire for perfection in every detail, and its philosophical aptitudes are well illustrated by the controversies now in vogue in the land of universities. In following the example of Germany, as we are prone to do in educational matters, we must beware lest we adopt what is there cast off; lest we introduce faults as well as virtues. Some of the ablest men in the new empire are now questioning whether the "*real* school" system, after a trial of so many years, is justified of its works; and whether the "gymnasium," somewhat modified, should not be the training-place of all who seek a higher culture. Others are questioning whether it is not a mistake to maintain polytechnic schools, and special schools of agriculture, forestry, mining, etc., apart from the

universities; and whether it would not be better to combine the higher educational foundations under one direction and in one center. Some of the best scientific men declare their belief that the university instruction in science, following the gymnastic discipline, is far better as a preparation for what are called the modern pursuits than the training which is given by the *real* school and the polytechnic, and so they assert that an exaggerated value has been attached to technical training.

I only allude to these discussions in passing. It would take many hours to unfold them. But it is well to bear in mind that the most enlightened institutions in our country, and the most enlightened countries in Europe, are those in which educational discussions are now most lively; and it behooves us, as we engage in a new undertaking, to observe and ponder, and, above all, to be modest in the announcement of our plans. It should make the authorities cautious in offering, and the public cautious in demanding, a completed scheme for the establishment of a university in Baltimore.

Our caution is none the less needed when we remember that at the present moment Americans are engaged in promoting institutions of higher education in Tokio, Peking, and Beirut, in Egypt and the Hawaiian Islands. The oldest and the remotest nations are looking here for light.

What is the significance of all this activity? It is a reaching out for a better state of society than now exists; it is a dim but an indelible impression

of the value of knowledge; it is a craving for intellectual and moral growth; it is a longing to interpret the laws of creation; it means a wish for less misery among the poor, less ignorance in schools, less bigotry in religion, less suffering in the hospital, less fraud in business, less folly in politics; it means more study of nature, more love of art, more lessons from history, more security in property, more health in cities, more virtue in the country, more wisdom in legislation; it implies more intelligence, more happiness, more religion.

The institutions which are founded in modern society for the promotion of superior education may be grouped in five classes: 1. Universities; 2. Learned Societies; 3. Colleges; 4. Technical Schools; 5. Museums (including literary and scientific collections). It is important that the fundamental ideas of these various institutions should be borne in mind.

The University is a place for the advanced and special education of youth who have been prepared for its freedom by the discipline of a lower school. Its form varies in different countries. Oxford and Cambridge universities are unlike the Scotch, and still more unlike the Queen's University in Ireland; the University of France has no counterpart in Germany; the typical German universities differ much from one another. But while forms and methods vary, the freedom to investigate, the obligation to teach, and the careful bestowal of academic honors are always understood to be among the university functions. The

pupils are supposed to be wise enough to select, and mature enough to follow, the courses they pursue.

The Academy, or Learned Society (of which the Institute of France, with its five academies, and the Royal Society of London, are typical examples), is an association of learned men, selected for their real or reputed merits, who assemble for mutual instruction and attrition, and who publish from time to time the papers they have received and the proceedings in which they have engaged. The University is also an association of learned men, but the bond which holds them together differs essentially from that of the Academy. In the universities teaching is essential, research important; in academies of science research is indispensable, tuition rarely thought of.

The College implies, as a general rule, restriction rather than freedom; tutorial rather than professorial guidance; residence within appointed bounds; the chapel, the dining-hall, and the daily inspection. The College theoretically stands *in loco parentis;* it does not afford a very wide scope; it gives a liberal and substantial foundation on which the university instruction may be wisely built.

The Technical Schools present the idea of preparation for a specific calling, rather than the notion of a liberal culture. They have in view the imparting of knowledge which will be useful in the practice of a profession, and often set forward, as a motive, an assured introduction to the

openings which are ready for those who have received their training.

Museums, Galleries, and Libraries (of which the British Museum is the grandest of all) are indeed connected with the other agencies we have named, but they often have an independent existence. They fulfil a twofold purpose: they preserve and store away the treasures of art, literature, and science; and they distribute widely among the people those seeds of culture which are developed by artistic, historic, and scientific acquisitions.

Thus we say that the Academy of Sciences promotes the intellectual attrition of the most learned men; the University favors the liberal and special culture of advanced students; the College trains aspiring youth for their future intellectual freedom; the Technical School affords a good preparation for a specific vocation; and the Museum provides materials for study, adapted, like the world itself, to interest the most profound and the most superficial.

Now it is clear that we might have a university without the four adjuncts I have named, and we might have the four accessories without the university; but practically wherever a strong university is maintained, these fourfold agencies revolve around it, as planets around the sun. In Baltimore you have hitherto had a college, an academy of sciences, professional schools, and a scholars' library, but you have not had such an endowed university as that which is now inaugurated.

Indeed, this new foundation might almost adopt the preamble which John Calvin prefixed to the statutes of the Academy of Geneva: "Verily hath God heretofore endowed our commonwealth with many and notable adornments, yet hath it to this day had to seek abroad for instruction in good arts and disciplines for its youth, with many lets and hindrances."

But soon I hope we may add what Erasmus said at Oxford: "It is wonderful what a harvest of old volumes is flourishing here on every side; there is so much of erudition, not common and trivial, but recondite, accurate, and ancient, both Greek and Latin, that I should not wish to visit Italy, except for the gratification of traveling."

The earliest foundations in our country were colleges, not universities. Scholars early in this century were often graduated at the age when they now enter. Earnest efforts are now making to establish universities. Harvard, with a boldness which is impressive, has essentially given up its collegiate restrictions, and introduced the benefits of university freedom; Yale preserves its college course intact, but has added a school of science and developed a strong graduate department; the University of Michigan and Cornell University early adopted the discipline of universities, and already equal or surpass not a few of their elder sisters; the University of Virginia from its foundation has upheld the university in distinction from the college idea. The cry all over the land is for university advantages, not as

superseding but as supplementing collegiate discipline.

As we are called upon to develop a university, it becomes important not only to distinguish its essential idea from that of any other institution, but also to form a clear conception of its special province; of various plans which have governed its organization; of the good which it promotes; of the questions which are settled; of the questions which are not settled; and especially of the bearing of all these points on our land, our times, and our foundation. Thus only shall we make a contribution to the intellectual agencies of this country, and add a positive gain to American learning and education in the second century of the Republic.

The tenor of my remarks has implied perhaps more diversity of opinion than really exists in respect to universities. The truth is, most institutions are not free to build anew; they can only readjust. It has been playfully said that "traditions and conditions" impede their progress. But whatever may be the concrete difficulties, on many abstract principles there is little need of controversy. Our effort will be to accept that which is determined, to avoid that which is obsolescent, to study that which is doubtful, to "make haste slowly."

Is, then, anything settled in respect to university education? Much, very much. Can we draw up a statement of what is agreed upon? At any rate we can try.

The schedule will include twelve points on which there seems to be a general agreement.

1. All sciences are worthy of promotion; or, in other words, it is useless to dispute whether literature or science should receive more attention, or whether there is any essential difference between the old and the new education.

2. Religion has nothing to fear from science, and science need not be afraid of religion. Religion claims to interpret the word of God, and science to reveal the laws of God. The interpreters may blunder, but truths are immutable, eternal, and never in conflict.

3. Remote utility is quite as worthy to be thought of as immediate advantage. Those ventures are not always the most sagacious that expect a return on the morrow. It sometimes pays to send our argosies across the seas, to make investments with an eye to slow but sure returns. So is it always in the promotion of science.

4. As it is impossible for any university to encourage with equal freedom all branches of learning, a selection must be made by enlightened governors, and that selection must depend on the requirements and deficiencies of a given people in a given period. There is no absolute standard of preference. What is more important at one time or in one place may be less needed elsewhere and otherwise.

5. Individual students cannot pursue all branches of learning, and just be allowed to select under the guidance of those who are appointed to counsel

them. Nor can able professors be governed by routine. Teachers and pupils must be allowed great freedom in their method of work. Recitations, lectures, examinations, laboratories, libraries, field exercises, and travels are all legitimate means of culture.

6. The best scholars will almost invariably be those who make special attainments on the foundation of a broad and liberal culture.

7. The best teachers are usually those who are free, competent, and willing to make original researches in the library and the laboratory.

8. The best investigators are usually those who have also the responsibilities of instruction, gaining thus the incitement of colleagues, the encouragement of pupils, and the observation of the public.

9. Universities should bestow their honors sparingly, their benefits most freely.

10. A university cannot be created in a day; it is a slow growth. The University of Berlin has been quoted as a proof of the contrary. That was indeed a quick success, but in an old, compact country, crowded with learned men eager to assemble at the Prussian court. It was a change of base rather than a sudden development.

11. The object of the university is to develop character—to make men. It misses its aim if it produces learned pedants, or simple artisans, or cunning sophists, or pretentious practitioners. Its purport is not so much to impart knowledge to the pupils, as to whet the appetite, exhibit meth-

ods, develop powers, strengthen judgment, and invigorate the intellectual and moral forces. It should prepare for the service of society a class of students who will be wise, thoughtful, and progressive guides in whatever department of work or thought they may be engaged.

12. Universities easily fall into ruts. Almost every epoch requires a fresh start.

If these twelve points are conceded, our task is simplified, though it is still difficult. It is to apply these principles to Baltimore in 1876.

We are trying to do this with no controversy as to the relative importance of letters and science, the conflicts of religion and science, or the relation of abstractions and utilities; our simple aim is to make scholars, strong, useful, and true.

This brings me to the question which has brought you here.

The Johns Hopkins University: what will be its scope? The trustees have decided to begin with those things which are fundamental, and move gradually forward to those which are accessory.

They will institute at first those chairs of language, mathematics, ethics, history, and science which are commonly grouped under the name of the department of philosophy.

The medical faculty will not long be delayed; that of jurisprudence will come in time; that of theology is not now proposed.

I have lately met with an ancient saying in respect to the development of a youth. "At five," the precept read, "he was to study the Scriptures;

at ten, the Mishna; at thirteen, the Talmud; at eighteen, to marry; at twenty, to attain riches; at thirty, strength; at forty, prudence; and so on to the end." So we begin with the essential, proceed to the important, expect enlarged endowments, and look for strength, prudence, and the other virtues as we grow in years.

In organizing a faculty, the first chairs to be filled are those which everywhere, always, and by all people in the modern republic of letters are regarded as needful. We must provide for the study of languages, ancient and modern; mathematics, pure and applied; science, natural and physical. All this is assumed as granted. But if we should do all this well, and do nothing more, we should not add much to the intellectual resources of the country. We must ask ourselves other questions: What special departments of learning are now neglected in the higher institutions of this country? What can we provide for? In what order shall we proceed?

These problems require profound consideration; their answer must depend on manifold conditions; their solution will doubtless be the result of much counsel. Partly to elicit the suggestions of other teachers, and partly to exhibit what seem to me the inevitable demands of this place, I shall suggest some of the departments of higher education which seem to require attention in this place.

When we turn to the existing provisions for medical instruction in this land and compare them with those of European universities; when we see

what inadequate endowments have been provided for our medical schools, and to what abuses the system of fees for tuition has led; when we see that in some of our very best colleges the degree of Doctor of Medicine can be obtained in half the time required to win the degree of Bachelor of Arts; when we see the disposition of the layman at home and the profession abroad to treat diplomas as blank paper, and the prevalence of quackery vaunting its diplomas; when we read the reports of the medical faculty in their own professional journals; and when we see the difficulties that have been encountered in late attempts to reorganize the existing medical schools, it is clear that something should be done. Then, turning to the other side of the picture, when we see what admirable teachers have given instruction among us in medicine and surgery; what noble hospitals have been founded; what marvelous discoveries in surgery have been made by our countrymen; what ingenious instruments they have contrived; what humane and skilful appliances they have provided on the battle-field; what admirable measures are in progress for the advancement of hygiene and the promotion of public health; what success has attended recent efforts to reform the system of medical instruction;— when we observe all this, we need not fear that the day is distant, we may rather rejoice that the morning has dawned which will see endowments for medical science as munificent as those now provided for any branch of learning, and schools

as good as those now provided in any other land.

It will doubtless be long, after the opening of the university, before the opening of the hospital; and this interval may be spent in forming plans for the department of medicine.

But in the meantime we have an excellent opportunity to provide instruction antecedent to the professional study of medicine. At the present moment medical students avoid the ordinary colleges. A glance at the catalogues is enough to show that the usual classical or academic course is unattractive to such scholars. The reasons need not be given here. But who can doubt that a course may be maintained, like that already begun in the Sheffield School at New Haven, which shall train the eye, the hand, and the brain for the later study of medicine? Such a course should include abundant practice in the laboratories of chemistry, zoölogy, and physics; the study of the anatomy, physiology, and pathology of the lower forms of life; an investigation of the elements of physics and mechanics, and of climatic and meteorological laws; the geographical distribution of disease; the remedial agencies of nature and art; and, besides these scientific studies, the student should acquire enough of French and German to follow with ease European science, and enough of Latin for his professional needs. In other words, in our scheme of a university, great prominence should be given to the studies which bear upon life—the group now called biologieal sciences.

Such facilities as are now afforded under Huxley in London, and Rolleston at Oxford, and Foster at Cambridge, and in the best German universities, should here be introduced. They would serve us in the training of naturalists, but they would serve us still more in the training of physicians. By the time we are ready to open a school of medicine, we might hope to have a superior, if not a numerous, body of aspirants for one of the noblest callings to which the heart and head can be devoted.

When the medical department is organized, it should be independent of the income derived from student fees, so that there may not be the slightest temptation to bestow the diploma on an unworthy candidate, or rather let me say, so that the Johns Hopkins diploma will be worth its face in the currency of the world.

Next to the study of man in his relations to nature comes the study of man in his relations to society. By this I mean his history, as exemplified in the monuments of literature and art, in language, laws, and institutions, in manners, morals, and religion. More particularly still I refer to the principles of good government, including jurisprudence on the one hand, and political economy on the other. Legislation, taxation, finance, crime, pauperism, municipal government, morality in public and private affairs, are among the special topics. The civil law, international law, the early history of institutions, in short, the history of civilization and the requirements of a modern state,

come under this department. If we may judge from what is said by some of the best publicists, the United States, at this moment, is suffering from the neglect of these studies. There is a call for men who have been trained by other agencies than the caucus for the discussion of public affairs; men who know what the experience of the world has been in the development of institutions, and are prepared by intellectual and moral discipline to advance the public interests, irrespective of party, and indifferent to the attainment of official stations. To this end our plans converge.

It is generally conceded by our most influential men of science and of affairs that, before many years have passed, an accurate survey of the area of the United States, corresponding with the ordnance and geographical surveys of Great Britain, France, Switzerland, and Germany, must be undertaken. Under what auspices and upon what plan remains to be determined. At present the heads of all the governmental surveys acknowledge the difficulty of finding men qualified enough to carry forward efficiently such work in all its manifold departments, astronomical, geodetical, topographical, meteorological, geological, zoölogical, botanical, economical. If our university can provide instruction in these departments of physical research, looking forward to the future development not only of Maryland and the Atlantic seaboard, but also of the entire land, it will do a good service.

There is a department of engineering which may also receive special attention here. The needs of

cities or large towns are such in our day that every center of population where fifteen or twenty thousand persons are assembled should have the services of a competent scientific engineer. He must, of course, have a general mathematical training; but he should also know how to use these fundamental principles in municipal affairs—in the preparation of exact maps; in the determination of the supplies of water and the methods of drainage; in the construction of roads, boulevards, pleasure-grounds, and parks, the building of wharves and docks, the supervision of gas-works and fire-engines, the erection of public buildings, monuments, and places of assembly. There should be a recognized preparation for this work of civic or municipal engineering, in distinction from civil engineering, which is a more vague and general term, including perhaps the subordinate branches to which I have referred.

Architecture is closely connected with this department. So far as I am aware, there are now, in this new country where so much building is in progress, but two schools for the professional study of this the first of arts.

I can hardly doubt that such arrangements as we are maturing will cause this institution to be a place for the training of professors and teachers for the highest academic posts; and I hope in time to see arrangement made for the unfolding of the philosophy, principles, and methods of education in a way which will be of service to those who mean to devote their lives to the highest departments of instruction.

But in forming all these plans we must beware lest we are led away from our foundations; lest we make our schools technical instead of liberal, and impart a knowledge of methods rather than of principles. If we make this mistake, we may have an excellent polytechnic school, but not a university.

Who shall be our teachers?

This question the public has answered for us; for I believe there is scarcely a preëminent man of science or letters, at home or abroad, who has not received a popular nomination for one of the professorships. Some of these candidates we shall certainly secure, and their names will be one by one made known. It is not an easy task to transplant a tree which is deeply rooted. It is especially hard to do so in our soil and climate. Though a migratory people, our college professors are fixtures. Such local college attachments are not known in Germany, and the promotions which are frequent in Germany are less thought of here. When we think of calling foreign teachers, we encounter other difficulties. Many are reluctant to cross the sea; and others are, by reason of their lack of acquaintance with our language and ways, unavailable. Besides, we may as well admit that foreign capitals afford facilities for literary and scientific growth and influence far beyond what our country affords. Hence it is probable that among our own countrymen our faculty will be chiefly found.

I wrote, not long ago, to an eminent physicist, presenting this problem. "We cannot have a

great university without great professors; we cannot have great professors till we have a great university: help us in the dilemma." Let me tell his answer. "Your difficulty," he says, "applies only to old men who are great; these you can rarely move; but the young men of genius, talent, learning, and promise, you can draw. They should be your strength."

The young Americans of talent and promise—there is our strength, and a noble company they are! We shall not ask from what college, or what State, or what church they come; but what do they know, and what can they do, and what do they want to find out.

In the biographies of eminent scholars it is curious to observe how many indicated in youth pre-eminent ability. Isaac Casaubon, whose name in the sixteenth century shed luster on the learned circles of Geneva, Montpellier, Paris, London, and Oxford, began as professor of Greek at the age of twenty-two; and Heinsius, his Leyden contemporary, at eighteen. It was at the age of twenty-eight that Linnæus first published his "Systema Naturæ." Cuvier was appointed a professor in Paris at twenty-six, and, a few months later, a member of the Institute. James Kent, the great commentator on American law, began his lectures in Columbia College at the age of thirty-one. Henry was not far from thirty years of age when he made his world-renowned researches in electromagnetism; and Dana's great work on mineralogy was first published before he was twenty-five years old, and

about four years after he graduated at New Haven. Look at the Harvard lists: Everett was appointed professor of Greek at twenty-one; Benjamin Peirce of mathematics at twenty-four; and Agassiz was not yet forty when he came to this country. For fifty years Yale College rested on three men selected in their youth by Dr. Dwight, and almost simultaneously set at work; Day was twenty-eight, Silliman twenty-three, and Kingsley twenty-seven, when they began their professorial lives. The University of Virginia, early in its history, attracted foreign teachers, who were all young men.

We shall hope to secure a strong staff of young men, appointing them because they have twenty years before them; selecting them on evidence of their ability; increasing constantly their emoluments, and promoting them because of their merit to successive posts, as scholars, fellows, assistants, adjuncts, professors, and university professors. This plan will give us an opportunity to introduce some of the features of the English fellowship and the German system of privat-docents; or, in other words, to furnish positions where young men desirous of a university career may have a chance to begin, sure, at least, of a support while waiting for promotion. Our plans begin but do not end here. As men of distinction, who have won the highest rank in their callings, are known to be free, we shall invite them to come among us.

For a time, at least, we shall also look to the faculties of other colleges for occasional help. Many years ago, among the plans for establishing

a university, in distinction from a college, at Cambridge, Professor Peirce proposed that various colleges should send up for a portion of the year, and for a term of years, their best professors, who should receive a generous acknowledgment for this service, and good opportunities for work, but should not renounce their college homes. Without having heard of his plan, which, I think, had not been made public, the trustees of the Johns Hopkins University have worked out a kindred scheme. They propose to ask distinguished professors from other colleges to come to us during a term of years, each to reside here for an appointed time, and be accessible *publice et privatim*, both in the lecture-room and the study.

Where do we look for students?

At first, at home, in Baltimore and Maryland; then, in the States adjacent; then, in the regions of our country where, by the desolations of war, educational foundations have been impaired; and presently, according to the renown of the faculty which we are able to bring here, and the completeness of the establishment, we hope that our influence will be national.

Of what grade will they be? Mature enough to be profited by university education. The exact standard is not yet fixed. It must depend on the colleges and schools around us; there must be no gap in the system, and we must keep ahead; but the discussions now in progress respecting the City College, Agricultural College, and St. John's College must delay our announcements. Our standard will doubtless be as high as the community requires.

In its Beginning

What will the buildings be?

At first, temporary, but commodious; in the heart of the city, accessible to all; and fitted for lectures, laboratories, library, and collections. At length, permanent, on the site at Clifton; not a medieval pile, I hope, but a series of modern institutions; not a monumental, but a serviceable, group of structures. At present laboratories are demanded on a scale and in a variety hitherto unknown, for chemistry, physics, geology and mineralogy, comparative anatomy, physiology, pathology. Oxford, with its New Museum; Cambridge, with its Cavendish laboratory; Owens College, with its excellent workrooms; South Kensington, with the new apartments of Huxley and Frankland; Leipsic, Vienna, Berlin, all afford illustrations of the kind of structures we shall need. Already measures have been initiated for the improvement of Clifton as a university site. Although it will take time to develop the plans, I hope that we shall all live to see the day when the simplicity, the timeliness, and the strength which characterized our founder's gift will be also apparent in the structures which his trustees erect; and when that site, beautiful in itself and already well planted, may be, in fact, an academic grove, with temples of learning so appropriate, so true, and so well built that no other ornament will be essential for beauty, and yet that in their neighborhood no work of art will be out of place.

Our affiliations deserve mention. Already harmonious relations have been established between this university and the Peabody Institute, the

Academy of Sciences, the City College, and the departments of State and city education. I may also add that the authorities of the scientific institutions in Washington have evinced in many ways good will toward their new ally in Baltimore. As this university grows, we may anticipate perpetual advantages from its proximity to the national capital, where the Smithsonian Institution, the Engineer Corps, the Naval Observatory, the Coast Survey, the Signal Service, the Botanical Gardens, the Congressional Library, the National Museum, the territorial surveys, the army medical and surgical collections, and the Corcoran Art Gallery are powerful instruments for the advancement of science, literature, and art.

The relation of this university to the higher education of women has not been as yet discussed by the trustees, and doubtless their future conclusions will depend very much upon the way in which the subject is brought forward. I am not at liberty to speak for them, but personally have no hesitation in saying that the plans pursued in the University of Cambridge (England), especially in the encouragement of Girton College, seem likely to afford a good solution of a problem which is not without difficulty, however it is approached. Of this I am certain, that they are not among the wise who depreciate the intellectual capacity of women, and they are not among the prudent who would deny to women the best opportunities for education and culture.

I trust the day is near when some one, following

the succession of Peabody and Hopkins, will institute here a "Girton College," which may avail itself of the advantages of the Peabody and Hopkins foundations, without obliging the pupils to give up the advantages of a home, or exposing them to the rougher influences which I am sorry to confess are still to be found in colleges and universities where young men resort. For the establishment in Baltimore of such a hall as Girton I shall confidently look.

If we would maintain a university, great freedom must be allowed to both teachers and scholars. This involves freedom of methods to be employed by the instructors on the one hand, and, on the other, freedom of courses to be selected by the students.

But this freedom is based on laws, two of which cannot be too distinctly or too often enunciated. A law which should govern the admission of pupils is this, that before they win this privilege they must have been matured by the long preparatory discipline of superior teachers, and by the systematic, laborious, and persistent pursuit of fundamental knowledge; and a second law, which should govern the work of professors, is this, that, with unselfish devotion to the discovery and advancement of truth and righteousness, they renounce all other preferment, so that, like the greatest of all teachers, they may promote the good of mankind.

I see no advantage in our attempting to maintain the traditional four-year class system of the American colleges. It has never existed in the Univer-

sity of Virginia; it is modified, though not nominally given up, at Harvard; it is not an important characteristic of Michigan or Cornell; it is not known in the English, French, or German universities. It is a collegiate rather than a university method. If parents or students desire us to mark out prescribed courses, either classical or scientific, lasting four years, it will be easy to do so. But I apprehend that many students will come to us, excellent in some branches of a liberal education and deficient in others—good perhaps in Greek, Latin, and mathematics; deficient in chemistry, physics, zoölogy, history, political economy, and other progressive sciences. I would give to such candidates, on examination, credit for their attainments, and assign them in each study the place for which they are fitted. A proficient in Plato may be a tyro in Euclid. Moreover, I would make attainments rather than time the condition of promotion; and I would encourage every scholar to go forward rapidly or go forward slowly, according to the fleetness of his foot and his freedom from impediment. In other words, I would have our university seek the good of individuals rather than of classes.

The sphere of a university is sometimes restricted by its walls, or is limited to those who are enrolled on its lists. There are three particulars in which we shall aim at extramural influence: first, as an examining body, ready to examine and confer degrees or other academic honors on those who are trained elsewhere; next, as a teaching body, by opening to educated persons (whether enrolled as

students or not) such lectures as they may wish to attend, under certain restrictions—on the plan of the lectures in the high seminaries of Paris; and, finally, as in some degree, at least, a publishing body, by encouraging professors and lecturers to give to the world in print the results of their researches.

Let us now turn from details and recur to general principles.

What are we aiming at?

An enduring foundation; a slow development; first local, then regional, then national influence; the most liberal promotion of all useful knowledge; the special provision of such departments as are neglected elsewhere in the country; a generous affiliation with all other institutions, avoiding interferences, and engaging in no rivalry; the encouragement of research; the promotion of young men; and the advancement of individual scholars, who by their excellence will advance the sciences they pursue and the society where they dwell.

What will be our agencies?

A large staff of teachers; abundance of instruments, apparatus, diagrams, books, and other means of research and instruction; good laboratories, with all the requisite facilities; accessory influences, coming both from Baltimore and Washington; funds so unrestricted, charter so free, and schemes so elastic, that, as the world goes forward, our plans will be adjusted to its new requirements.

What will be our methods?

Liberal advanced instruction for those who want

it; distinctive honors for those who win them; appointed courses for those who need them; special courses for those who can take no other; a combination of lectures, recitations, laboratory practice, field-work, and private instruction; the largest discretion allowed to the faculty consistent with the purposes in view; and, finally, an appeal to the community to increase our means, to strengthen our hands, to supplement our deficiencies, and especially to surround our scholars with those social, domestic, and religious influences which a corporation can at best imperfectly provide, but which may be abundantly enjoyed in the homes, the churches, and the private associations of an enlightened Christian city.

This great undertaking does not rest upon the trustees alone; the whole community has a share in it. However strong our purposes, they will be modified, inevitably, by the opinions of enlightened men: so let parents and teachers incite the youth of this commonwealth to high aspirations; let wise and judicious counselors continue their helpful suggestions, sure of being heard with grateful consideration; let skilful writers, avoiding captiousness on the one hand and compliment on the other, uphold or refute or amend the tenets here announced; let the guardians of the press diffuse widely a knowledge of the benefits which are here provided; let men of means largely increase the usefulness of this work by their timely gifts.

At the moment there is nothing which seems to me so important, in this region, and indeed in the entire land, as the promotion of good secondary

schools, preparatory to the universities. There are old foundations in Maryland which require to be made strong, and there is room for newer enterprises of various forms. Every large town should have an efficient academy or high school; and men of wealth can do no greater service to the public than by liberally encouraging, in their various places of abode, the advanced instruction of the young. None can estimate too highly the good which came to England from the endowment of Lawrence Sheriff at Rugby and of Queen Elizabeth's school at Westminster, or the value to New England of the Phillips foundations in Exeter and Andover.

Every contribution made by others to this new university will enable the trustees to administer with greater liberality their present funds. Special foundations may be affiliated with our trust, for the encouragement of particular branches of knowledge, for the reward of merit, for the construction of buildings; and each gift, like the new recruits of an army, will be the more efficient because of the place it takes in an organized and efficient company. It is a great satisfaction in this world of changes and pecuniary loss to remember what safe investments have been made at Harvard and Yale, and other old colleges, where dollar for dollar is still shown for every gift.

The atmosphere of Maryland seems favorable to such deeds of piety, hospitality, and "good will to men." George Calvert, the first Lord Baltimore, comes here, returns to England, and draws up a

charter which becomes memorable in the annals of civil and religious liberty, for which "he deserves to be ranked," as Bancroft says, "among the most wise and benevolent lawgivers of all ages"; among the liberals of 1776 none was bolder than Charles Carroll of Carrollton; John Eager Howard, the hero of Cowpens, is almost equally worthy of gratitude for the liberality of his public gifts; John McDonogh, of Baltimore birth, bestows his fortune upon two cities for the instruction of their youth; George Peabody, resident here in early life, comes back in old age to endow an athenæum, and begins that outpouring of munificence which gives him a noble rank among modern philanthropists; Moses Sheppard bequeaths more than half a million for the relief of mental disease; Rinehart, the stonecutter, attains distinction as a sculptor, and bestows his well-won acquisitions for the encouragement of art in the city of his residence; and a Baltimorean still living provides for the foundation of an astronomical observatory in Yale College; while Johns Hopkins lays the foundation for learning and charity which we celebrate to-day.

Let me enlist attention from the youth of Baltimore. For you, my young friends, these great advantages are provided. What will be your response? Is there not among you some bookbinder's boy, like Michael Faraday, who will be led by our Royal Institution to a line of research for which the world will be better; is there not here some private teacher, like Cuvier, or some minister's son, like Agassiz, burning with a desire to pursue the

study of natural history; is there not some sophomore in college, like Alexander Hamilton, ready to discuss the questions of public finance, eager to be trained by a master economist; is there not in Baltimore a genius in mathematics, like Gauss, who at three years old corrected his father's arithmetic, at eighteen entered the University of Göttingen, where he made a discovery which had puzzled geometers "from the days of Euclid," and who died at seventy-seven, among the most eminent of his time? If so, I say it is for you, bright youths, that these doors are opened. Enter the armory and equip yourselves.

Gentlemen of the board of trustees, the duty you assigned me of unfolding your plans is now imperfectly discharged. I hope that I have not struck too low a key in speaking of the opportunities, and, on the contrary, that I have not said anything in rivalry or boast. If I have seemed cautious, you are sanguine, invigorated by the force of a lofty purpose and the comforting consciousness of ample means. If I have seemed sanguine, you are cautious, aware that there are other institutions, older, richer, and more experienced than this, whose example we must study, and whose help we must seek.

Before concluding, I repeat in public the assent which I have privately made to your official overtures. In speaking of your freedom from sectarian and political control, you expressed to me a hope that this foundation should be pervaded by the spirit of an enlightened Christianity; while you

proposed to train young men for the service of the State and the responsibilities of public life, you hoped the university would never engage in sectional, partizan, and provincial animosities. In both these propositions I now, as then, express my cordial and entire concurrence.

Our work now begins. This place is felicitous, midway between the extremes of North and South, and redolent of memories of men and women whose names the world will never forget. This day is suggestive, reminding us of one whose wise moderation wrought great achievements. This year is auspicious, inviting us to sink political animosities in sentiments of fraternal good will, and of patriotic regard for a reunited republic. This company is inspiring; the city, the State, and the older seats of learning, far and near, here express their good will. Most welcome among their utterances are the words with which the oldest college in the land extends its fellowship to the youngest.

So, friends and colleagues, we launch our bark upon the Patapsco, and send it forth to unknown seas. May its course be guided by looking to the heavens, and the voyage promote the glory of God and the good of mankind.

Permit one word of a personal character before I take my seat. My life thus far has been spent in two universities, one full of honors, the other of hopes; one led by experience, the other by expectations. May the lessons of both, the old and the new, be wisely blended here. There is not a place in all the land which I should be so glad to fill as

that in which I have been placed by your favorable consideration; but the burdens will be heavy unless your kind indulgence is continued. Standing almost within sight of the monument which has given a name to this city, do not deem it presumptuous if I adopt the words which Washington addressed to the citizens of Baltimore in 1789, and say on his memorial day, as he said then:

> I know the delicate nature of the duties incident to the part I am called to perform, and I feel my incompetence without the singular assistance of Providence to discharge them in a satisfactory manner; but having undertaken the task from a sense of duty, no fear of encountering difficulties and no dread of losing popularity shall ever deter me from pursuing what I take to be the true interests of my country.

THE UTILITY OF UNIVERSITIES

AN ANNIVERSARY DISCOURSE

JOHNS HOPKINS UNIVERSITY, FEBRUARY 22, 1885.

When the following address was delivered, the comments which had been made upon the work of the University seemed to call for a new exposition of its principles and aims.

THE UTILITY OF UNIVERSITIES

TO be concerned in the establishment and development of a university is one of the noblest and most important tasks ever imposed on a community or on a body of men. It is an undertaking which calls for the exercise of the utmost care, for combination, coöperation, liberality, inquiry, patience, reticence, exertion, and never-ceasing watchfulness. It involves perplexities, delays, and risks. Mistakes cannot possibly be avoided; heavy responsibility is never absent. But history and experience light up the problem; hope and faith give animation to the builders when they are weary and depressed. Deeply moved by these considerations, I desire to bring before you, my colleagues in this work, without whose labors all would be a failure, you who are trustees, and you who are teachers, before the citizens of Baltimore, and before this company of students pressing forward to take the places of authority in the work of education and administration—before you all, I wish to bring some aspects of university life, which, if not new, may perhaps

be stated in terms which are fresh, with illustrations drawn from our own experience.

I ask you to reflect at this time on the relation of universities to the progress of civilization, and I begin by assuming that we are agreed substantially on the meaning of both these terms. The word "university," as applied to a learned corporation, is several hundred years old, and in all times and lands has embodied the idea of the highest known agency for the promotion of knowledge and the education of youth. "Civilization" is a new word, hardly introduced a century ago, though the idea which it embodies is as old as organic society. Guizot, to whose eloquence we owe the popularity of this term, avoids its formal definition, declaring in general terms that civilization is the grand emporium of a people, in which all its wealth, all the elements of its life, all the powers of its existence, are stored up. "Wherever," as he goes on to say, "the exterior condition of man becomes enlarged, quickened, or improved; wherever the intellectual nature of man distinguishes itself by its energy, brilliancy, and grandeur—wherever these two signs concur, and they often do so, notwithstanding the gravest imperfections in the social system, there man proclaims and applauds civilization." Assuming, then, that by "university" the highest school is understood, and by "civilization" the highest welfare of mankind, let us inquire into the influence which the advancement of knowledge by means of superior educational establishments has exerted or may exert upon the progress of society.

The Utility of Universities

A little reflection will remind us of five great agencies by which modern Christian civilization is helped forward: first, the family, the unit of our social organization, recognized by Aristotle as the basis of society, and styled by modern philosophers the "focus of patriotism"[1] and the very "starting-point of social morality"; next, trade or commerce, the exchange of one man's products for another's, the traffic between communities and nations; third, law and custom, written and unwritten, the enforcement of duties and defense of rights, the equitable adjustment of conflicting claims; fourth, religion, the acknowledgment of personal responsibility to an infinite and all-controlling Power. The last to be named is knowledge, the recorded observations and experience of our race in ancient and in modern times, or, in other words, scientia, science in its broadest significance.

These five influences, working in dwelling-houses, market-places, state-houses, churches, libraries and schools, control our modern life; and that state of society is the best in which domestic virtue, mercantile honor and the freedom of exchange, obedience to law, pure and undefiled religion, and the general diffusion of knowledge are the dominant characteristics. We are concerned at present with the last only of these five factors.

The means by which our race has acquired knowledge and preserved its experience are manifold. The inhabited world is a great laboratory, in which human society is busily experimenting. Obser-

[1] Lieber. [2] Maurice.

vation, exploration, and reflection have been allied in interpreting the physical characteristics of the globe, ever since the primeval law, "Subdue the earth," was heard by primitive man; experiments in social organization have also been made on a colossal scale and in little microcosms; war has taught its pitiful lessons; superstition, irreligion, vice, and crime, as well as literature, art, law, religion, and philosophy, have all been teachers; customs, traditions, epics, creeds, codes, treaties, inscriptions, parchments, books, pyramids, temples, statues, museums, schools, pulpits, platforms, have all been employed to perpetuate and diffuse the knowledge which has been acquired; but ever since Europe emerged from the darkness of the middle ages, universities have been among the most potent of all agencies for the advancement and promulgation of learning. Their domain, the republic of letters, has been wider than the boundaries of any state; their citizens have not been restricted to any one vocabulary; their acquisitions have been hid in no crypt. They have gathered from all fields and distributed to all men. Themes the most recondite, facts the most hidden, relations the most complex, have been sought out and studied, that, if possible, the laws which govern the world might be discovered, and man made better.

In one of our halls there hangs a diagram which I never pass without pausing to think of its significance. It contains a list of European universities founded since the dawn of modern states—a period of more than seven centuries, a list of over two

hundred names. Every state in Europe, every great city, has its high school. Popes, emperors, kings, and princes have been their founders; ecclesiastics, reformers, republics, municipalities, private citizens, munificent women, have contributed to their maintenance. Wherever European civilization has gone, the idea of the university has been carried with it—to North and South America, to Australia, even to India, China, and Japan; it came with the Virginians to Williamsburg, with the New-Englanders to Cambridge and New Haven; it was planted in California before there was an organized State on the Pacific slope.

The idea is often vague, sometimes perverted, commonly half developed, at times inflated; nevertheless it contains this principle of life, that in every civilized community there must be a high school, capping, crowning, binding all other institutions for the advancement of learning.

Allow me to turn your attention to some historical illustrations.

Notwithstanding the great renown of Charlemagne, greatest of monarchs between Cæsar and Napoleon, the fact that his empire was founded upon the principle of superior education is not so familiar; but a recent writer[1] has given us an instructive essay on the schools of Charles the Great, and a still more recent writer[2] has made a study of their influence. "If his reign marks the dividing-line between ancient and modern history," says the latter, "it is not only by virtue of its political facts,

[1] Mr. J. B. Mullinger. [2] Mr. R. L. Poole.

but also because he begins the education of the Northern races, fitting them in time to rule the world as the Romans had done before them."

Several instances in modern history may be cited, in each of which the close of a great civil commotion has been marked by the foundation of a university. One of them is quite familiar. A little more than three hundred years ago, Leyden, so lately freed from the horrors of a siege, "so lately the victim of famine and pestilence, had crowned itself with flowers." The university was to be inaugurated. In the grand procession rode a female figure, the Holy Gospel, attended by Four Evangelists; then came other allegorical figures, emblematic of Law, Medicine, and the Liberal Arts, and then the magistrates and dignitaries. Down the Rhine floated the semblance of Apollo and the Muses, and each professor, as he advanced, "was kissed by Apollo and all the nine Muses in turn," whose salutations found further expression in "an elegant Latin poem." I have taken these statements, as you doubtless surmise, from the pages of Motley, to show you the enthusiasm of the Low Countries for their university; but a truer impression of the work then inaugurated would be given by recounting the roll of the great men who have taught in that university, and of the great scholars whom they have trained. Grotius, Descartes, Scaliger, Boerhaave, Wyttenbach, Arminius, and Gomar were among the early scholars who resided in Leyden, and the list might be extended until it reached our own contemporaries and our own countrymen.

A few years earlier, when the Reformation in England was nearly completed, Henry VIII reorganized the University of Cambridge, and laid the foundations of that splendid college,—which might be called a university in itself, if ever a college could claim the more comprehensive name, Trinity College,—which, before the century had passed, trained for the world that great triumvirate whose statues glorify the approach to the chapel—Isaac Barrow, Lord Bacon, and Sir Isaac Newton.

The foundation of the University of Berlin is a noteworthy modern instance of the erection of a great high school in a time of national sorrow. The story has often been given, and was recently made the opening passage in an inaugural address by Helmholtz. Prussia had been overrun by France, the resources of the state were almost exhausted, but Frederick William III, led on by William von Humboldt, Stein, and other great intellects, determined to infuse new spirit into a despondent people, by conferring on them the greatest benefit which it was in his power to bestow, a university, founded on such a liberal plan that it rose at once to the very front rank.

So, within our recollection, that monarch's greater son, the Emperor William, when Strasburg had been reclaimed by Germany, determined that it should be the seat of a university, and already that new foundation stands among the strongest and best of German high schools.

These examples of universities founded each of them at the close of a sharp social crisis often occur

to my mind when I remember that our foundation was projected at the close of a civil war, and was established in the firm belief that it would bind together in the love of literature and science all classes and all creeds. A physician who has lately died in communion with the Roman Catholic Church often said to me: "I tell everybody that there is one thing on which we can all agree, and that is the university"; and still another, of the same religious creed, has just written me: "I sincerely hope to see your prediction as to all Christian forces come true. Life is too short, and there is too much good to be done, to have any force or energy wasted in barren controversy."

I have made these historical allusions, most of which, I am well aware, are familiar, in order to raise the questions: Why is it that universities are so highly esteemed? What are the advantages which follow their foundation? Remembering that a university is the best organization for the liberal education of individuals, and the best organization for the advancement of science, apply the double test, what is done for personal instruction, and what is done for the promotion of knowledge, and you will be able to judge any institution which assumes this name.

Ask, first, if it is a place of sound education. Are the youth who are trained within its walls honest lovers of the truth—are they learned, are they ready, are they trustworthy? When they leave the academic classes, do they soon find a demand for their services? Do they rise in profes-

sional life? Are they sought for as teachers? Do they show aptitude for mercantile, administrative, or editorial life? Do they acquit themselves with credit in the public service? Do the books they write find publishers? Do they win repute among those who have added to the sum of human knowledge? Have they the power of enjoying literature, music, and art? Can they apply the lessons of history to the problems of our day? Are they always eager to enlarge their knowledge? Do they become conservative members of society, seeking for progress by steady improvements rather than by the powers of destruction and death? Are they useful, courteous, coöperative citizens, in all the relations of life? Do the charities, the churches, the schools, the public affairs of the community, receive their constant consideration? Are there frequent manifestations among them of unusual ability in science, in literature, in oratory, in administration? As the roll of the alumni increases and the graduates are counted by hundreds and not by scores, does it appear that a large proportion are men of honorable, faithful, learned, and public-spirited character? These are the questions by which, as the years go on, a university is to be tested; to sum all questions in one, is it proved to be a place for the development of manliness?

I beg leave to dwell a little longer upon this text, because I think there is danger of its importance being overlooked. The material resources of a university, the aggregate numbers who attend its courses, its numerous buildings, its great collec-

tions, appeal to everybody; only those who look at results are competent to give a conclusive opinion, and their opinion cannot be formed in one decade. A generation is the briefest period for a fair review. When the year of our Lord 1900 comes, this foundation will be a quarter of a century old. To that remote tribunal we appeal for judgment on our work of to-day. But we may anticipate this final verdict, and ascertain by our own inspection and inquiry what is done in any institution for the education of youth, what opportunities are afforded, how those advantages are regarded by the most intelligent young men, and what kind of scholarship is developed at the termination of the academic course.

Here let me protest against the common method of estimating intellectual work by numerical standards alone. I have heard it said that some men are possessed by a statistical devil. They can only think in figures; they will ask, in respect to a new acquaintance, how much is he worth; of a library, how many volumes there are; of an orchestra, how many pieces; of a college, how many students. I have known the expenses of an institution made a dividend, and the number of scholars the divisor, the quotient representing the cost of each pupil. All this is wrong, absolutely wrong. If such a standard were allowable, the largest number of scholars taught by the cheapest teacher would be the greatest success. It is not the number but the quality of students which determines the character of a high school. It is important to count; it is better to weigh.

The Utility of Universities

Having spoken of what the university does for individuals, let us consider its second function. It benefits society as well as individual men. It renders services to the community which no demon of statistics can ever estimate, no mathematical process ever compute. These functions may be stated as the acquisition, conservation, refinement, and distribution of knowledge.

These carefully chosen words I proceed to explain.

1. It is the business of a university to advance knowledge; every professor must be a student. No history is so remote that it may be neglected; no law of mathematics is so hidden that it may not be sought out; no problem in respect to physics is so difficult that it must be shunned. No love of ease, no dread of labor, no fear of consequences, no desire for wealth, will divert a band of well-chosen professors from uniting their forces in the prosecution of study. Rather let me say that there are heroes and martyrs, prophets and apostles of learning, as there are of religion. To the claims of duty, to the responsibilities of station, to the voices of enlightened conscience, such men respond, and they throw their hearts into their work with as much devotion and as little selfishness as it is possible for human nature to exhibit. By their labors, knowledge has been accumulated, intellectual capital has been acquired. In these processes of investigation the leading universities of the world have always been engaged.

This is what laboratories, museums, and libraries signify. Nothing is foreign to their purpose, and

those who work in them are animated by the firm belief that the advancement of knowledge in any direction contributes to the welfare of man. Nor is research restricted to material things; the scholars of a university are equally interested in all that pertains to the nature of man, the growth of society, the study of language, and the establishment of the principles of intellectual and moral conduct.

2. Universities are conservative. They encourage the study of the history, the philosophy, the poetry, the drama, the politics, the religion—in fine, the experience of antecedent ages. Successors of the ancient monasteries, they keep alive in our day the knowledge of ancient languages and art, enrich the literature of our mother-tongue, hold up to us the highest standards of excellence in writing, and enable us to share in the thoughts of the noblest of our race. Let me especially remind you that to the universities men turn instinctively for light on the interpretation of the Scriptures. When new manuscripts are discovered, or new versions are proposed, or new monuments are unearthed, it is to the universities, where the knowledge of ancient and remote tongues has been cherished, that the religious world looks for enlightenment and guidance. Their dominant influence is highly spiritualizing; I would even go further and say that it is truly religious. I am not unmindful that within the academic circles men are found whose spiritual insight is but dim,—so it is in all other circles,—but I assert, without fear of contradiction, that the influence of study is, on the whole, favorable to the growth of spiritual

life, to the development of uprightness, unselfishness, and faith, or, in other words, it is opposed to epicureanism and materialism. In belief there are tides, as there are in the ocean, ebb and flow, flow and ebb; but the great ocean is there, with its deep mysteries, unchanging amid all superficial disturbances. Faith, with all its fluctuations, is as permanently operative in human thought as knowledge.

3. Universities are refining. They are constantly, by laborious processes, by intricate systems of coöperation, and by ingenious methods, engaged in eliminating human errors and in submitting all inherited possessions to those processes which remove the dross and bring out the gold. No truth which has once been discovered is allowed to perish, but the incrustations which cover it are removed. It is the universities which edit, interpret, translate, and reiterate the acquisitions of former generations in both literature and science. Their revelation of error is sometimes welcomed, but it is generally opposed; nevertheless the process goes on, indifferent alike to plaudits or reproaches. If their lessons are hard to the beginners, they lead the persevering to high enjoyment.

4. Universities distribute knowledge. The scholar does but half his duty who simply acquires knowledge. He must share his possessions with others. This is done, in the first place, by the instruction of pupils. Experience has certainly demonstrated that, with rare exceptions, those men are most learned who produce most. The process of acquiring seems

to be promoted by that of imparting. The investigator who is surrounded by a bright circle of friendly inquisitors and critics finds his best powers developed by this influence. Next to its visible circle of pupils, the university should impart its acquisitions to the world of scholars. Learned publications are therefore to be encouraged. But beyond these formal and well-recognized means of communicating knowledge, universities have innumerable less obvious, but not less useful, opportunities of conveying their benefits to the outside world.

These general principles I propose to illustrate by asking you to go with me around the circle of the sciences, that we may observe the part which universities have taken or should take in respect to various departments of knowledge.

Let me begin by saying that a university should discover and teach all that can be known of the human body. If you ask me why this is so important, I reply, in order that every one may be able to lead a healthier, stronger, and more rational life than is now possible for the want of more knowledge. Hospitals are essential to alleviate sufferings which have been encountered; physical training is of great value; but still more important to humanity is the laboratory in which are studied the laws of life. A celebrated physiologist declares that "a hundred years of life is what Providence intended for man," and others tell us that most of our minor ailments may easily be avoided, and the number of efficient days may be largely increased. Science has proved that many diseases which used to scourge the civi-

lized world may be prevented, and it has recently brought us within reach of new discoveries which will still further interrupt the progress of pestilence. The employment of anesthetics has marvelously alleviated the sufferings of humanity. The causes and remedies of cerebral excitement and degeneration have never been understood as now, and the possibilities have never been so great for the restoration to their normal activity of the powers which have been alienated. In view of these great results and of these anticipations, it is clearly the duty of a university to study all the forms and functions of life which are manifested in organisms lower than man, all the laws which govern animal and vegetable growth, all that can possibly throw light on human physiology.

Those who are devoted to research of this kind, revealing with their microscopes the structure and the life-histories of the minutest organisms, are constantly, and in most unexpected ways, coming upon new illustrations of the plan of creation, which have an important bearing upon the welfare of man. They are the interpreters of nature and the benefactors of humanity; and I do not hesitate to add that if there is any branch of learning which at the present time deserves the most generous support, it is surely biology, because of its obvious relations to the health and happiness of every human being. I cannot but think that those who oppose its study will be ranked in future years among the obscurantists of the nineteenth century.

Next, I mention, as the subject for university

study, psychology, the nature of man's soul, the characteristics of his mental and moral activity. This science has lately made great progress; it has improved its methods and enlarged its scope. Those who are devoted to it appreciate the inherited experiences of the human race, and are not indifferent to the lessons which may proceed from intuition and introspection; they study all the manifestations of intellectual and spiritual life; but, on the other hand, they are not afraid to inquire, and they know how to inquire, into the physical conditions under which the mind works; they watch the spontaneous, unconventional actions of children; they investigate the laws of heredity; they examine with curious gaze the eccentricities of genius, and with discerning, often with remedial eye, the alienation of human powers; and they believe that by a combination of these and other methods of research, among which experiment has its legitimate place, the conduct of the human understanding and the laws of progressive morality will be better understood, so that more wholesome methods of education will be employed in schools of every grade. They acknowledge the superiority of the soul to the body, and they stand in awe before the mysteries which are as impenetrable to modern investigators as they were to Leibnitz and Spinoza, to Abelard and Aquinas, to Aristotle and Plato—the mysteries of man's conscious responsibility, his intimations of immortality, his relations to the Infinite.

I do not know whether philosophy is on a "return

to Kant," or to common sense, but I believe that, standing firm on the postulates, God, soul, and immortality, it will in years to come disentangle many perplexities, brush away heaps of verbal accumulations, and lead the mind to purer and nobler conceptions of righteousness and duty. I go even further, and, as I believe that one truth is never in conflict with another truth, so I believe that the ethics of the New Testament will be accepted by the scientific as well as the religious faculties of man: to the former, as law; to the latter, as gospel.

In confirmation of these views, let me quote to you the language of that one among us who is best qualified to speak upon this subject:

> The new psychology, which brings simply a new method and a new standpoint to philosophy, is, I believe, Christian to its root and center; and its final mission in the world is not merely to trace petty harmonies and small adjustments between science and religion, but to flood and transfuse the new and vaster conceptions of the universe and of man's place in it—now slowly taking form, and giving to reason a new cosmos, and involving momentous and far-reaching practical and social consequences—with the old scriptural sense of unity, rationality, and love beneath and above all, with all its wide consequences. The Bible is being slowly re-revealed as man's great text-book in psychology, dealing with him as a whole, his body, mind, and will, in all the larger relations to nature and society, which has been so misappreciated simply because it is so deeply divine. That something may be done here to aid this development [continues the lecturer] is my strongest hope and belief.[1]

[1] G. Stanley Hall.

The study of society engages the earnest interest of another set of men, and the apparatus of their laboratory includes archæological and historical memorials of the activity of the race. The domain of history and political science has never been cultivated as it is in modern times. The discovery of primeval monuments and the interpretation of long-hidden inscriptions, the publication of ancient documents once hidden in monasteries and governmental archives, the inquiry into primitive forms of social organization, the development of improved modes of research, the scientific collection and classification of facts which illustrate the condition of ancient and modern communities, and especially the interest awakened in the growth of institutions and constitutions, give to this oldest of studies the freshest interest. Papers which have lately been printed on rudimentary society among boys, on the laws of the mining-camp, on the foundations of a socialist community, on the differences between parliamentary and congressional government, on the derivation of modern customs from the ancient beginnings of the Aryan people, on the nature of communism, and many more such themes, afford illustrations of the mode in which the historical student among us, following the lines of Stubbs, Maine, Freeman, Seeley, Bluntschli, Roscher, and other celebrated workers, is advancing historical science and developing the true historical spirit. The aim of all these inquiries is to help on the progress of modern society by showing how the fetters which now bind us were forged, by what patient filing they must be

severed, and at the same time to work out the ideal of a society in which liberty is everywhere, but "liberty sustained by law."

Languages and literature have always received attention in universities, and will always be dominant, for reasons which are as enduring as language itself. We study tongues that we may know the men of other climes and other days; we study literature to enjoy it. As an aid to intercourse with people of other nations, and for the purpose of keeping up with the record of modern science, nobody doubts that the study of modern languages is to be encouraged; but if we really would own the inheritance which is our birthright, if we wish to appreciate the masterpieces of literature, if it is well to put ourselves in sympathy with mankind, to laugh with those who have laughed, and weep with those who have wept, we must not be restricted to the writings of to-day. In science, it has been said, read the newest and latest; not so in literature, but the best. Isaiah and John, Homer and Æschylus, Cicero and Virgil, the Nibelungenlied and Chaucer, Dante and Petrarch, are as full of life, beauty, instruction, and entertainment to us as to former generations. But from the classical standard of excellence this busy world would soon depart, were it not that in every university there are scholars keeping bright the altar-fires, and warming us with the glow of their enthusiasm whenever we come under their influence, sharpening, too, our wits by their critical acumen.

It is not uncommon, nowadays, to hear objections

to classical education, usually from those who have never had it, and declamations against dead languages, usually from those who have never learned them. But the humanists may unquestionably leave it to the geologists to fight the battle for antiquity. The latter assure us that the older the fossils the more instructive their lessons; indeed, so much importance is attached to ancient animal life that the national government, with great liberality, encourages its study by promoting explorations, museums, and costly publications. Be it so; but let not the nation which does this forget that men are of "more value than many sparrows"; that the oldest literature is not old or dead, but fresh and living in comparison with the bones of the cave-dwellers; and that, though a megatherium is wonderfully instructive, an ancient epic or a drama is equally worthy of attention.

Jebb, in his "Life of Bentley," asserts that probably "the study of classical antiquity, in the largest sense, has never been more really vigorous than it is at the present day." We might add that classical poetry has never been so popular; else why these innumerable editions and translations? Why, after Worsley, Butcher, Bryant, and their predecessors, are we reading aloud and smiling over the immortal Odyssey, as it is given to us in the rhythmical prose of Palmer? This is a good sign; only it is well to remember that reading translations is not reading Greek, and, as Jebb goes on to say, we must not forget the difference between "the knowledge at second-hand" which the intelligent public

can possess, and "the knowledge at first-hand" which it is the business of the libraries and professorships of a university to perpetuate.

If the defenders of classical study would confine their argument to the line which was lately followed by Butcher, they would silence their opponents. "To Greece," he says, "we owe the love of science, the love of art, the love of freedom—not science alone, art alone, or freedom alone, but these vitally correlated with one another and brought into organic union. . . . The Greek genius is the European genius in its first and brightest bloom. From a vivifying contact with the Greek spirit, Europe derived that new and mighty impulse which we call progress."

But I must not pass from the subject without a word upon the study of language in general, that faculty of the human race which was never half understood until the universities of Germany entered upon the study of comparative philology, by the introduction of the study of Sanskrit. With this new torch they have thrown a flood of light upon the nature of speech, the history of our race, the brotherhood of nations, and the development of ideas which lie at the basis of all Indo-European civilization.

The Shemitic tongues have long been subjects of university study, especially Hebrew and Arabic—the former so much esteemed as the language of the Old Testament that it used to be spoken of as the language of Paradise, and the latter being regarded as a key to the ideas and religion, the an-

cient literature and science, of one of the largest families of men. Of late years the domain of Shemitic study has been widened; libraries long hidden have been exhumed on the sites of ancient Babylon and Nineveh; records the very existence of which was unknown at the beginning of this century, written in characters to which there was then but the slightest clue, are now read and printed and studied as a part of the history of mankind. Assyrian becomes a language of university study, not, indeed, for many scholars, but for a few, and the bearing of their discoveries is so important upon the language and history of the Hebrews that one of the most learned of English theologians has recently said that, in respect to certain of the obscurer passages of the Old Testament, the world must wait for the light which will come from Assyriology.

Certainly, if the history of mankind is worth studying, if the lessons of the past are of value, language and literature, the ancient, the modern, the primitive, and the cultivated, will never be neglected among the studies of an enlightened community.

When we turn from man to his environment, we soon perceive that mathematics lies at the basis of all our knowledge of this world. To count, to measure, and to weigh are steps in civilization, and as we extend our powers in these directions, we find that even the distance and mass of the planets, the form of the earth, the velocity of light, the mechanical equivalent of heat, and the unit of electrical resistance may be accurately ascertained, and the

results, with many of the ideas which they involve, may become a part of the intellectual possessions of every educated person. Yet when we reflect that hardly any branch of knowledge is so depreciated by the average man as the modern advancement of pure mathematics, we must believe that its influence upon civilization is not sufficiently considered.

Professor Cayley, in a recent address, alluded to the connection of mathematics with common life, on the one hand, and with the deepest questions of philosophy,—for example, the metaphysical ideas of time and space,—on the other. As to its utility, he declared that he would defend this science, as Socrates defended justice, quite irrespectively of worldly advantages; and then he proceeded to show the relations of mathematics to the certainty of knowledge, and to emphasize the idea that mathematical science is not built upon experience, but upon certain fundamental assumptions, which are, indeed, found to be in conformity with experience. I wish that every student, however remote his studies may be from mathematical text-books, would turn to the opening passages of this discourse, and steady his own mental equilibrium by the assurance that the science which is most exact, and most satisfactory in its reasonings, is based upon fundamental postulates which are assumed and not proved by experiment. "In the theory of numbers," he says, "these are very remarkable instances of propositions observed to hold good for very long series of numbers, and which are nevertheless untrue."

If you persist in taking the utilitarian view, and ask me what is the good of Mr. Glaisher's determination of the least factors of the missing three out of the first nine million numbers, the volume containing the sixth million having lately been published; or if you put a much more comprehensive question, as to the use of the Abelian functions, I shall be forced to say, I do not know; and if you press me harder I shall be obliged to express my conviction that nobody knows; but I know, and you know, and everybody may know who will take the pains to inquire, that the progress of mathematics underlies and sustains all progress in exact knowledge.

Whewell, the author of the "History of Inductive Sciences," has brought out very clearly the fact that "the opening of Greek civilization was marked by the production of geometry, the idea of space was brought to a scientific precision; and likewise the opening of modern European civilization was distinguished by the production of a new science, mechanics, which soon led to the mechanics of the heavens, and this step, like the former, depended on men arriving at a properly distinct fundamental idea, the idea of force." Henry Smith, arguing for the value of his favorite study to mankind, points out the injury which would come to the intellectual strength of any nation "whose notions of the world and of the things in it were not braced and girt together with a strong framework of mathematical reasoning. It is something," he continues, "for men to learn what proof is and what it is not.

The work in mathematics at Alexandria or Syracuse, two thousand years ago, is as perfect in its kind, and as direct and unerring in its appeal to our intelligence, as if it had been done yesterday at Berlin or Göttingen by one of our own contemporaries." In kindred language, Cayley, working forward as well as backward, and not unmindful, let us hope, of the Sylvestrian school upon this side of the Atlantic, in which he had been a teacher and a guest, thus concluded the address from which I have already quoted:

> Mathematics have steadily advanced from the time of the Greek geometers. Nothing is lost or wasted; the achievements of Euclid, Archimedes, and Apollonius are as admirable now as they were in their own days. Descartes's method of coördinates is a possession forever. But mathematics have never been cultivated more zealously and diligently, or with greater success, than in this century—in the last half of it or at the present time; the advances made have been enormous, the actual field is boundless, the future full of hope. In regard to pure mathematics we may most confidently say:
>
> "Yet I doubt not through the ages one increasing purpose runs,
> And the thoughts of men are widened with the process of the suns."

Many who hesitate to assent to these views of the relation of pure mathematics to civilization have no question whatever in lauding applied mathematics, especially astronomy and physics; and no wonder, for within the memory of this generation the world has gained these five results of physical science: steam locomotion, telegraphy, telephony,

photography, and electric lighting. The first three, it may be said, have revolutionized the methods of human intercourse; the fourth has multiplied infinitely the means of communicating knowledge to the brain by what Sir William Thomson, following John Bunyan, has termed the eye-gate; and the fifth, still in its dawn, includes possibilities of illumination which we are not likely to exaggerate. But I have no time to eulogize these recent gains of civilization; every word I can spare must be given to emphasize the fact, which is most likely to be forgotten, that these wonderful inventions are the direct fruit of university studies. I do not undervalue the work of practical men when I say that the most brilliant inventor who ever lived has been dependent upon an unseen company of scholars, the discoverers and the formulators of laws which he has been able to apply to methods and instruments. Nor do I forget that Faraday, like Shakspere, was not a university man. But I mean to say that the manifold applications of science, about which everybody is talking, are only possible because of the abstract studies which universities promote. The electromagnetic inventions, which are now so multiform, are only possible because scores of the greatest intellects of the century, one after another, have applied their powers of absolute reasoning to the interpretation of phenomena which could have been elucidated in any part of the world, and at any epoch of the past, if only the right methods had been employed. As long as universities held aloof from experimental sciences, these discoveries were

not made; but when laboratories for investigation were established, an alliance was formed by mathematics and physics, and a new type of intellectual workers was produced, men whose hands were as cunning to construct and make use of instruments as their brains were cunning to develop the formulæ of mathematics. Take the splendid list of leaders who have followed Franklin and Rumford. They may be called the school of Sir Isaac Newton, so much of their inspiration is due to him. Not all were trained in academic walls; but not one failed to derive help from the advantages which universities provide and perpetuate.

One of the greatest of these men, Sir William Thomson, has lately been here. He was invited to come because it was believed that he, more than any other foreigner, could give an impulse to the study of physics in this country. His lectures were on a subject so remote from ordinary thought that I do not suppose its announcement conveys to those who are unfamiliar with the present position of physical inquiries the least idea of what the lecturer was to talk about. Nevertheless so great was the attraction of his powers that a large company—two or three from England, one from Japan, several from beyond the Alleghanies, and many from this neighborhood, most of them teachers and professors of physics—here assembled daily for a month to catch what they could of his learning and his enthusiasm. His words were taken down and have been given to the public in the form of lecture notes, and have thus reached already the principal seats of learning

abroad and at home; but the chief results of his visit will be seen, as the years go on, in the increased devotion of his followers to their science, and in their emulation of his enthusiasm and concentration. Could I give you a more interesting example of the way in which a university may encourage physical science?

Notwithstanding all the progress in physics and astronomy which has been made during a century, those who know the most about these subjects will assure us that they are but at the alphabet of their science. Read the address of the astronomer of Princeton, on a recent occasion, in which he enumerates the impending problems of astronomy; or that of one of our own staff, when he reviews the condition of electrical science, and declares that "as the region of the unknown is infinitely greater than the known, there is no fear of there not being work for the whole world for centuries to come"; and he adds (to please, I suppose, the practical men) that, in the applications of science, "the telephone, the telegraph, and electric lighting are but as child's play to what the world will see."

Chemistry is the child of the nineteenth century. The atomic theory, which lies at the foundation of all modern investigations, was announced by Dalton (that English Friend, after whom it would not be amiss to name our chemical laboratory "Dalton Hall," as a tribute alike to his eminence and to the society in which our founder was also trained),—Dalton's law, I say, was announced between 1804 and 1808, so that we can trace more dis-

tinctly than in most sciences the exact influences under which chemistry has grown up. Alchemy, the search for gold or for the philosopher's stone, never became a science, and contributed very little to the good of man; but when the universities of Europe, with their trained observers, their methods of accurate work, their habit of publication, and especially their traditional principles of coöperative study, directed their attention to the fundamental laws of atomic combination, the science of chemistry grew with rapidity, and with benefits to mankind which can never be enumerated. To no man were its early days more indebted than to Liebig,— "of organic chemistry the very source and fountain-head,"—good as a thinker, good as an investigator, good as a lecturer, but better still, as one of his most illustrious pupils has informed us, "in the peripatetic teaching of his laboratory."

"It was at the small University of Giessen," says Hofmann, from whom I have just quoted, that "Liebig organized the first educational laboratory that was ever founded. This school forms an epoch in chemical science. It was here that experimental instruction such as now prevails in our laboratories received its earliest form and fashion; and if we are proud of the magnificent temples raised to experimental science in all our schools and universities, let it never be forgotten that they all owe their origin to the prototype set up by Liebig, half a century ago." The world appreciates the results which have proceeded from these laboratories; let it also be remembered that they were the creation,

not of industrial fabrics, not of mercantile corporations, not even of private enterprise, but of universities, and that the motive which inspired their founders and directors was not the acquisition of wealth, but the ascertainment of fundamental law.

The science, which began with the century, is going forward more rapidly than ever. Yet, if we examine a recent exposition of the principles of theoretical chemistry, we may discover that here, as in mathematics and in physics, the most expert perceive that the field which is open to investigation is much vaster than that which has been surveyed. Here, as everywhere else, the higher one ascends the greater his horizon. What good is to come to men from these researches it would not be wise to predict; but we may reflect on what has recently occurred. Within the last few months a boon has been conferred on humanity, so great that all the cost of all the laboratories of all the lands in Christendom would have been a small price to pay for so precious a pearl. It came into the world, never again to leave it, unheralded, unexpected, from the laboratory of science, to deaden for a few moments and then restore to life the organs of the sight, so that operations on the eye, hitherto dreaded, may be performed without the slightest pain. The chemists may modestly say that this discovery was an accident, not to be compared in significance with the discovery of Avogadro's law. That may be so, yet this sort of accident does not happen in Africa or the Fiji Islands; it "happens" where there are universities and laboratories, and trained men able

and ready to observe phenomena, and discover and apply principles.

In this rapid review, I have hardly introduced a theme which would be more appropriate for a volume than for a discourse. I have not spoken of the study of the structure of the earth, the physics of the globe, the laws of storms, the constituent rocks and minerals of the earth, the record of life hidden in ancient strata, the living kingdoms of animals and plants, the distribution of the races of men, the progress of archæology, or of innumerable subdivisions in the great branches of human knowledge. Such a task would be beyond my powers; I have only attempted to suggest what each one of you may study for the rest of your lives, as you watch the growth of universities and the progress of knowledge. I have purposely avoided all questions pertaining to professional and technical education.

A few miles east of one of my former homes—the settlement of Berkeley in California—there is an isolated peak of moderate height, from the top of which you may survey an area equal to that of the State of New York. From Mount Shasta on the north to Mount Whitney on the south, you may trace the jagged, often snow-white, crest which bears the name of Sierra Nevada. Here and there a peak rises a little higher than its neighbors, and can be identified from the lookout; but human vision cannot see the chains beyond the chains, nor the marvelous valley Yosemite and the beautiful Lake Tahoe, which are sheltered within the nearest

range of hills. All that the eye can distinguish on the horizon are a few of the loftiest summits, as it turns toward the east, and a glimpse of the Farallones Islands, as it turns toward the west. So to-day, from a hill not very high, we have looked upon a broad area, distinguishing only the chief features of the landscape; but we have seen the mountains and the sea.

THE CHARACTERISTICS OF A UNIVERSITY

AN ADDRESS BEFORE THE PHI BETA KAPPA SOCIETY OF HARVARD UNIVERSITY

JULY 1, 1886

This address was delivered in the year when Harvard commemorated its two hundred and fiftieth anniversary, and on the day when the second President Dwight became President of Yale. This explains some of the historical allusions.

THE CHARACTERISTICS OF A UNIVERSITY

NO one can visit Cambridge this summer without remembering that two hundred and fifty years ago an acorn was here planted from which an oak has grown. No scholar can come from a distant State without wishing to offer his tribute, however inadequate it may be, to the wisdom which has governed the counsels of Harvard through eight generations. A graduate of Yale will, I trust, be pardoned for associating the name of his own alma mater with that of her elder sister. Their united influence has not only been strong in New England, but strong in other portions of the land. It is difficult to surmise what would have been the condition of American society if these foundations had never existed. Their graduates have promoted the literature, the science, the statesmanship, and the religion of the land; but more than this is true. Their methods of instruction, their unwritten laws, their high endeavors, and their academic spirit have reappeared in each new State of the West, as each new

State has initiated its social order. To be governed by the experience of Harvard and Yale is in many an educational court an appeal to common law. To establish another Harvard or another Yale, to nurture the germ from which a great university might grow, has been the aspiration of many a patriot, of many a Christian. It was a laureate of both Harvard and Yale, the sagacious Manasseh Cutler, who initiated the policy of securing in the States beyond the Alleghanies a certain portion of the public lands for the foundation of universities. Among the pioneers of California was one who went from New England "with college on the brain," and now every ship which enters the Golden Gate faces the buildings of a university which Henry Durant did much to establish.

The history of higher education as guided by the two oldest foundations in this country may be considered in four periods: in the first, extending from the earliest settlement until the Revolution, the English college idea was dominant in its simplest form; the second, following the severance of allegiance to the crown, was the time when professional schools in medicine, law, and theology were begun; the third, beginning about the middle of this century, was marked by the formation of scientific schools; and in the present period we are looking for the fulfilment of the university ideal brought hither by the earliest immigrants from England.

The colonial vocabulary was modest. Whatever else it might be, "university" seemed a very great noun, to be used as guardedly as "episcopacy" or

"sovereignty." In the earliest mention I remember of the cradle of Harvard, the alternative is found, "a school or colledge"; and in Connecticut "collegiate school" was in vogue for seventeen years. "We on purpose gave your academy as low a name as we could, that it might the better stand in wind and weather," said the well-known civilians who were consulted in 1701 by Pierpont and his colleagues at the mouth of the Quinnipiac. Elsewhere, under other influences, there was not the same caution—nor the same success. Several years before the settlement of Massachusetts Bay, the Virginia Company determined to set apart, at Henrico, ten thousand acres of land for "a university," including one thousand for a college "for the children of the infidels." There was another project for a university, as early as 1624, which has lately been brought to light. Dr. E. D. Neill, in "Virginia Vetusta," calls attention to the fact that an island in the Susquehanna, which the traveler may see to the north as he crosses the railroad bridge at Havre de Grace, was conditionally given for "the foundinge and maintenance of a universitie, and such schools in Virginia as shall there be erected, and shall be called *Academia Virginiensis et Oxoniensis.*" The death of the projector, Edward Palmer, interrupted his plans.

Mr. Dexter has established the fact that before 1647 nearly a hundred graduates of English universities had migrated to New England, three fourths of whom were from Cambridge; and the elaborate volumes of Mullinger exhibit in great

fullness the conditions of collegiate and university life as they were known to these Cambridge wanderers in the earlier half of the seventeenth century. It is evident that the university idea was then subordinate to the collegiate; logic was riding a high horse; science and literature, as then represented by mathematics and Greek, were alike undervalued. An anecdote recorded by Mullinger reveals at a glance the situation. "Seth Ward, having lighted on some mathematical works in the library of Sidney, could find no one to interpret them. The books, says his biographer, were Greek —I mean unintelligible to all the fellows." The spirit of observation, experiment, and research was rarely apparent; discipline by masters and tutors took precedence of the inspiration of professors. When we consider this origin, still more when we recall the poverty of the colonists, and especially when we think of the comprehensiveness of the university ideal, even in the seventeenth century, it is not strange that, before the Revolution, American colleges were colleges and nothing more. Even degrees were only conferred in the faculty of arts. In 1774, when Governor Hutchinson was discussing colonial affairs in Lord Dartmouth's office, Mr. Pownall asked if Harvard was a "university," and if not, on what pretense it conferred degrees. Hutchinson replied "that they had given Masters' and Bachelors' degrees from the beginning; and that, two or three years ago, out of respect to a venerable old gentleman they gave him a Doctor's degree, and that the next year, or next but one, two or

three more were made Doctors. . . . After so long usage he thought it would be hard to disturb the college."

It is a significant fact that at the beginning of the Revolution, in 1776, George Washington was made a Doctor of Laws at Harvard, and at its close, in 1783, John Warren a Doctor of Medicine. From that time on there was no hesitation in the bestowal of degrees in other faculties than that of arts.

I need not rehearse the steps by which the schools of medicine, law, and theology were added to the college, cautiously, indeed (as outside departments, which must not be allowed to draw their support from the parent trunk), and yet permanently. It is a noteworthy fact that the example of Harvard and Yale in establishing theological schools has rarely been followed in other places, even where schools of law, medicine, and science have been established. It is enough to add that professional education was organized during the first thirty or forty years of this century, in a much less orderly way than that in which the colleges were instituted.

The third period in the development of higher education was the recognition of the fact that, besides the three traditional professions, a multitude of modern vocations require a liberal training. In consequence of this came scientific schools, often, at first, adjacent to the classical colleges, yet sometimes on independent foundations, many of these schools being aided by the national provision for technical instruction.

We are now fairly entered upon the fourth period, when more attention than ever before will certainly be given to the idea of the university—an idea long dormant in this country. The second decennium of this century was but just begun when a university was chartered in Maryland; and before it closed, the first of the Western universities, endowed by a gift of the public lands, was organized in the county and town of Athens, Ohio, precursor of the prosperous foundation in Michigan, and of like institutions in other parts of the old Northwestern territory. Early in this century Americans had frequently gone abroad for medical and scientific training, but between 1820 and 1830 many turned their eyes to Germany for historical and philological study; and the line which began with Everett, Ticknor, Bancroft, and Woolsey has been unbroken to this day. Through these returning wanderers, and through the importation from Germany, England, and Switzerland of foreigners distinguished as professors,—Lieber and Beck, Sylvester and Long, Agassiz and Guyot, and their compeers,—the notion of a philosophical department of a university, superior to a college, independent of and to some extent introductory to professional schools, has become familiar. But the boldest innovation, and the most influential, was the work of one whose name is perpetually associated with the Declaration of Independence and the University of Virginia. It was in 1826 that his plans assumed form and introduced to the people of this country, not without some opposition, the free methods of Conti-

nental universities, and especially of the University of France.

Thus, as years have rolled on, the word "university," at first employed with caution, has been reiterated in so many connections that it has lost its distinctive significance, and a special plea must be made for the restoration to its true sovereignty of the noblest term in the vocabulary of education. Notions injurious and erroneous are already abroad. Poor and feeble schools, sometimes intended for the destitute, beg support on the ground that they are universities. The name has been given to a school of arts and trades, to a school of modern languages, and to a school in which only primary studies are taught. Not only so, but many graduates of old and conservative institutions, if we may judge from recent writings, are at sea. There are those who think that a university can be made by so christening it; others who suppose that the gift of a million is the only requisite; it is often said that the establishment of four faculties constitutes a university; there is a current notion that a college without a religion is a university, and another that a college without a curriculum is a university. I have even read in the newspapers the description of a building which "will be, when finished, the finest university in the country"; and I know of a school for girls the trustees of which not only have the power to confer all degrees, but may designate a board of lady managers possessing the same powers.

Surely it is time for the scholars of the country to take their bearings. In Cambridge, the anniver-

sary so soon to be celebrated will not be allowed to pass without munificent contributions for most noble ends; the president of Yale College, who this day assumes his high office with the unanimous plaudits of Yalensians, is the representative of the university idea based upon academic traditions; the voice of Princeton, like a herald, has proclaimed its purposes; Cornell has succeeded in a litigation which establishes its right to a large endowment; the Secretary of the Interior has commended to Congress the importance of a national university, and a bill has been introduced looking toward such an establishment; the Roman Catholic Church, at its recent council in Baltimore, initiated measures for a university in the capital of the nation; while on the remotest borders of the land the gift of many millions is assured for promoting a new foundation. Already in the Mississippi Valley men are laboriously unfolding their lofty ideals. It is therefore a critical time. Wise plans will be like good seed; they will spring up and bear fruit a hundredfold. Bad plans will be like tares growing up with the wheat, impossible to eradicate.

It is obvious that the modes of organization will vary, so that we shall have many different types of universities. Four types have already appeared: those which proceed from the original historic colleges; those established in the name of the State; those avowedly ecclesiastical; and those which are founded by private benefactions. Each mode of organization has advantages which may be defended, each its limitations. If the older colleges

suffer from traditions, the younger lack experience and historic growth. The State universities are liable to political mismanagement; ecclesiastical foundations are in danger of being narrow.

UNDER these circumstances, I ask you to consider the characteristics of a university, the marks by which it should be distinguished.

It is needless before this audience to repeat the numerous definitions which have been framed, or to rehearse the brilliant projects which have been formed by learned, gifted men; but it will not be amiss to recall some of the noble aims which have always inspired endeavors to establish the highest institutions of learning.

Among the brightest signs of a vigorous university is zeal for the advancement of learning. Another phrase has been lately used, the "endowment of research." I prefer the other term, for it takes us back to the dawn of modern science, and connects our efforts with those of three hundred years ago, when Francis Bacon gave an impulse to all subsequent thought, and published what his recent biographer has called the first great book in English prose of secular interest —"the first of a long line of books which have attempted to teach English readers how to think of knowledge, to make it really and intelligently the interest, not of the school or the study or the laboratory only, but of society at large. It was a book with a purpose, new then, but of which we have seen the fulfilment."

The processes by which we gain acquaintance

with the world are very slow. The detection of another asteroid, the calculation of a new orbit, the measurement of a lofty peak, the discovery of a bird, a fish, an insect, a flower, hitherto "unknown to science," would be but trifles if each new fact remained apart from other facts; but when among learned men discoveries are brought into relations with familiar truths, the group suggests a law; the law an inference; the inference an experiment; the experiment a conclusion; and so from fact to law, and from law to fact, with rhythmic movement, knowledge marches on, while eager hosts of practical men stand ready to apply to human life each fresh discovery. Investigation, coördination, and promulgation are not performed exclusively by universities; but these processes, so fruitful in good, are most efficient where large numbers of the erudite and the acute, of strong reasoners and faithful critics, are associated for mutual assistance, correction, and encouragement. It is an impressive passage with which the lamented Jevons closed his "Principles of Science." After reminding the reader of the infinite domain of mathematical inquiry, compared with which the whole accomplishments of a Laplace or a Lagrange are as the little corner of the multiplication table, which has really an indefinite extent, he goes on to say that inconceivable advances will be made by the human intellect unless there is an unforeseen catastrophe to the species or the globe. "Since the time of Newton and Leibnitz, whole worlds of problems have been solved, which before were hardly con-

ceived as matters of inquiry. In our own day, extended methods of mathematical reasoning, such as the system of quaternions, have been brought into existence. What intelligent man will doubt that the recondite speculations of a Cayley or a Sylvester may possibly lead to some new methods, at the simplicity and power of which a future age will wonder, and yet wonder more that to us they were so dark and difficult?"

Let me draw an illustration from another science which will be acknowledged as of transcendent importance even by those, if such skeptics there be, who have no confidence in transcendental mathematics. Cohnheim, the great pathologist of Germany, whose death occurred in 1884, declares, in the introduction to his "General Pathology," that the study of the causes of disease is absolutely without limits, for it touches upon the most heterogeneous branches of science. Cosmical physics, meteorology, and geology, not less than the social sciences, chemistry, as well as botany and zoölogy, all bring their contributions to that branch of pathology. So with all his knowledge and ability this leader in pathology restricted his own work to the study of disordered physiological functions. But what prevention of suffering, what sanitary alleviations, what prolongation of life, may we not anticipate in future generations, when man thoroughly understands his complex environment and adapts himself to it?

In the accumulation of knowledge, as of other forms of wealth, saving must follow earning. So

among the offices of a university we find the conservation of experience. Ignorant as the nineteenth century appears when we survey the long category of inquiries now held in abeyance by mathematicians, astronomers, physicists, chemists, and biologists, by ethnologists, philologers, historians, and publicists, remember how much man has advanced since the ages of stone, of iron, and of brass. Such books as Tylor's and Morgan's, such observations as those of Livingstone and Stanley, show us what man is without a history; what society is where no storage is provided for the lessons learned by successive generations, and where the wisest and best are content to pass away, leaving no sign. It is the business of universities not only to perpetuate the records of culture, but to bring them out in modern, timely, and intelligible interpretations, so that all may know the laws of human progress, the dangers which imperil society, the conditions of advancing civilization. Experiments upon fundamental laws, such as the establishment of home rule, or the adjustment of the discord between industry and capital, may destroy or may promote the happiness of many generations. That mistakes may not be made, historical politics must be studied, and what is this but the study of the experience of mankind in endeavors to promote the social welfare? As there have been great lawgivers in the past, whose codes have been put to secular tests, so momentous experiments have run through centuries and involved the welfare of nations—experiments which have been recorded and interpreted,

but which call for still closer study, by the wisest intellects, before their lessons are exhausted. Can such researches be made in a moment? Can they be undertaken by a knight of labor? Are the facts to be gathered in a circulating library? Or must we depend upon scholars trained to handle the apparatus of learning? Gladstone and Bryce and Morley may or may not be right in all the subordinate features of the measures which they are advocating; but their influence at this very moment is resting on the fulcrum of historic knowledge, the value of local self-government. Hamilton, Jefferson, Madison, and Marshall were far from being "inspired" when they initiated the constitutional measures by which the United States is governed, and there is abundant evidence to show that they were students of the past experience of mankind in confederated politics. The compact of the *Mayflower* was reduced to writing within the sheltering arm of Cape Cod, but its ideas are those of men who knew the laws of Moses and Solomon, and who had seen in Holland, as well as in England, what favors and what hinders the development of civil and religious liberty. Within the shadow of the University of Leyden a stone marks the spot where John Robinson lived, taught, and died; and the name of Elder Brewster of the *Mayflower* has been recently discovered among the matriculates of Peterhouse, Cambridge, the oldest of the colleges on the Cam. In our own day the pioneers of 1849 carried with them to the remotest shores of the continent ideas which soon took the form of laws, customs, colleges,

schools, churches, hospitals, unknown under the Mexican sway; but they had learned these ideas in the historic schools of the Atlantic seaboard.

The universities are the natural conservators of educational experience, and should be recognized as the guides of public education. In a better state of society means will be found to make the men of learning in a given generation responsible for the systems of primary teaching, giving potency to their counsel not only at the end but in every stage of scholastic life. Upon text-books, courses of study, methods of discipline, the qualifications of teachers, the value of rewards, honors, and examinations, the voice of the universities should be heard. The confusion and uncertainty which now prevail are indications that, in schools of the lowest as of the highest grades, readjustments are needed which can only be wisely directed by those whose learning embraces the experience of many generations. The wisest are none too wise in pedagogics, but they are better counselors than the ignorant.

Dr. Lieber, in a letter to Secretary Seward, at the close of the Civil War, presented a strong plea for the reference of international disputes to universities. Reminding the secretary that their authority had been invoked upon internal controversies in France and Germany, he asked, why not refer to them in international affairs? The law faculty of a renowned university in a minor State would seem, he says, "almost made for this high function, and its selection as a court of international arbitration would be a measure worthy of England

and the United States"; and he risks the prophecy that "the cis-Caucasian race will rise at no very distant day to the selection of such umpires, far more dignified than a crowned arbitrator can be."

AMONG the offices of a university there is one too often undervalued or perhaps forgotten—the discovery and development of unusual talent. I do not speak of genius, which takes care of itself. Nobody can tell how it comes to pass that men of extraordinary minds are born of commonplace parentage and bred in schools of adversity away from books and masters. Institutions are not essential to their education. But every one who observes in a series of years the advancement of men of talents, as distinguished from men of genius, must believe that the fostering diet of a university—its "plain living and high thinking"—favors the growth of scholars, investigators, reasoners, orators, statesmen of enduring reputation, poets, and discoverers. Such men are rarely produced in the freedom of the wilderness, in the publicity of travel and of trade, or in the seclusion of private life; they are not the natural product of libraries and musuems, when these stand apart from universities; they are rarely produced by schools of a lower grade. Exceptions are familiar, but the history of civilization declares that promising youth should have the most favorable opportunities for intercourse with other minds, living as well as dead, comrades as well as teachers, governors as well as friends. It declares that in most cases talents will seize opportunity, and oppor-

tunity will help talents. Just now, in our own country, there is special reason for affirming that talents should be encouraged without respect to property. Indeed, it is quite probable that the rich need the stimulus of academic honors more than the poor; certainly the good of society requires that intellectual power, wherever detected, should be encouraged to exercise its highest functions.

Cardinal Newman (in a page which refers to Sir Isaac Newton's perception of truths, mathematical and physical, though proof was absent, and to Professor Sylvester's discovery, a century and a half later, of the proof of Newton's rule for ascertaining the imaginary roots of equations) says that a parallel gift is the intuitive perception of character possessed by certain men, as there are physicians who excel in diagnosis, and lawyers in the detection of crime.

Maurice, the great theologian of our day, was so strong an advocate of university education that he suggests a sort of *quo warranto* forcing "those who are destined by their birth or property to anything above the middle station in society, and intended to live in England, . . . to show cause why they do not put themselves in the best position for becoming what Coleridge calls the *clerisy* of the land."

DEVOTION to literature will always distinguish a complete university. Within the academic walls you may always find the lover of humanities; here, in perpetual residence, those who know the Athenian dramatists, the Augustan poets, the medieval

epic writers, Chaucer and Shakspere, and the leaders in literature of every name and tongue. In the class-rooms of the university, successive generations of youth should be presented to these illustrious men. The secrets of their excellence should be pointed out, the delights of literary enjoyment should be set forth, the possibilities of production in our day should be indicated, and withal the principles of criticism should be inculcated, as remote from sarcasm and fault-finding, on the one hand, as from prostrate adoration and overwrought sympathy, on the other.

It is common in these days to lament that the taste of the public, as indicated by the remorseless self-recording apparatus of the public libraries and the glaring advertisements of the book-stalls, is depraved; but it is well to remember that many counteracting influences are vigorous. Never was Shakspere read and studied as he is to-day; never was Chaucer so familiar to the youth at school; never was the Bible so widely read; never were such translations accessible as are now within reach of all. In all this the power of the universities is felt; give them the credit. But in the future let more attention than ever before be given to the study of literature and art. Fortunate would it be if in every seat of learning such a living teacher could be found as a Wordsworth, a Tennyson, a Browning, an Arnold, or a Lowell.

Among the characteristics of a university I name the defense of ideality, the maintenance of spirituality. There are those in every generation who

fear that inquiry is hostile to religion. Although universities are the children of the Christian church, although for a long period the papal sanction was desirable, if not essential, to their establishment, although the earliest colleges in this country were strictly religious, and although almost every denomination in the land desires its own university, there is an undercurrent of talk which shows that the influence of the higher education is now regarded in certain circles as adverse to spiritual and religious life. If this were so, many would prefer to see the academic walls fall down in a night, and the treasures of the ages reduced to smoke and ashes. But, fortunately indeed, there is no such danger. Alarmists are cowards. That piety is infantile which apprehends that knowledge is fatal to reverence, devotion, righteousness, and faith. As the most recent utterances of science point more and more steadily to the plan of a great designer, as the studies of psychology and of history confirm the doctrine, at least as old as Solomon, that righteousness exalteth a nation, so we may affirm that the two essentials of Christianity, on which hang all the law and the prophets,—the love of God and the love of our neighbor,—are enforced and not weakened by the influence of universities. We may also rest assured that institutions devoted to the ascertainment of truth as the ultimate object of intellectual exertion, and to the promulgation of truth as an imperative moral obligation, are not the harbingers of harm. Individuals will err; generations will labor under false ideas; domineering intel-

lects will dazzle for a time the ordinary mind; error, like disease, must be clearly understood before the mode of correction can be formulated; but there is no better way known to man for securing intellectual and moral integrity than to encourage those habits, those methods, and those pursuits which tend to establish truth.

Near the close of his address before the University of Munich, at the celebration of its jubilee in 1872, a great theologian, Dr. Döllinger, referred to the perils of the times in words which were received with prolonged applause. "Who knows," said he, "but that for a time Germany may remain confined in that strait prison, without air and light, which we call materialism? This would be a forerunner of approaching national ruin. But this can only happen in case the universities of Germany, forgetting their traditions and yielding to a shameful lethargy, should waste their best treasures. But no; our universities will form the impregnable wall ready to stop the devastating flood."

THE maintenance of a high standard of professional learning may also be named among the requisites of a university. So it is on the continent of Europe, so partially in Great Britain, so it should be everywhere. The slender means of our fathers compelled them to restrict their outlays to that which was regarded as fundamental or general education, and so it came to pass (as we have already been reminded) that professional schools were established in this country as independent

foundations. Even where they are placed under the university ægis, they have been regarded as only children by adoption, ready enough for the funds which have been provided for academic training, but without any claims to inherit the birthright. The injury to the country from this state of things is obvious. The professional schools are everywhere in danger of being—nay, in many places they actually are—places of technical instead of liberal education. Their scholars are not encouraged to show a proficiency in those fundamental studies which the experience of the world has demanded for the first degree in arts. It is well known that many a medical school graduates young men who could not get admission to a college of repute; ought we then to wonder that quackery is popular, and that it is better to own a patent medicine than a gold-mine? It was a wise and good man who said that there is no greater curse to a country than an uneducated ministry; and yet how common it is for the schools of theology in this country to be isolated from the best affiliations! Lawyers are too often trained with reference to getting on at the bar, and find themselves unprepared for the higher walks of jurisprudence and statesmanship; and members of Congress and of the State legislatures frequently exhibit to the world poverty of preparation for the critical duties which devolve upon them. I am far from believing that university schools of law, medicine, and theology will settle the perplexing questions of the day, either in science, religion, or politics; but if the experience of the world is worth

anything, it can nowhere be so effectively and easily acquired as in the faculties of a well-organized university, where each particular study is defined and illuminated by the steady light which comes from collateral pursuits and from the bright suggestions of learned and gifted teachers. Moreover, science has developed in modern society scores of professions each of which requires preparation as liberal as law, medicine, or theology. The schools in which modern sciences are studied may indeed grow up far apart from the fostering care of universities, and there is some advantage doubtless, while they are in their early years, in being free from academic traditions; but schools of science are legitimate branches of a modern university, and are gradually assuming their proper relations. In a significant paragraph which has lately appeared in the newspapers, it is said that with the new arrangements for instruction in the University of Cambridge, England, its degree of Engineer will be one of the most valuable which can anywhere be attained.

FINALLY, among the merits of a university is the cultivation of a spirit of repose. As the distractions of modern civilization multiply, as newspaper enterprise brings to our daily vision the conflicts and transactions of mankind, as books become superabundant, and periodicals more and more indispensable, and more and more technical, some corrective must exist, or there will be no more enjoyment in an intellectual life than there is in making money in the turmoil of the bourse. The

whirl of the nineteenth century has already affected the colleges, with detriment to that seclusion which best promotes the acquisition of knowledge. A man of varied experience in public affairs has said that a great university should be at once "the best place of education, the greatest machine for research, and the most delicious retreat for learned leisure." This is doubtless the truth, but it is only a half-truth. Universities with ample resources for the support of investigators, scholars, thinkers, and philosophers, numerous enough, learned enough, and wise enough to be felt among the powers of the age, will prove the safeguards of repose, not only for those who live within their learned cloisters, but for all who come under their influence. A society of the choicest minds produced in any country, engaged in receiving and imparting knowledge, devoted to the study of nature, the noblest monuments of literature, the marvelous abstractions of mathematical reasoning, the results of historical evidence, the progress of human civilization, and the foundations of religious faith, will be at once an example of productive quietude and an incitement to the philosophic view of life, so important to our countrymen in this day, when the miserable cry of pessimism, on the one hand, and the delightful but deceitful illusions of optimism, on the other hand, are in danger of leading them from the middle path, and from that reasonableness of mind which first recognizes that which is, and then has the hope and courage to strive for the better.

The Characteristics of a University

In what has now been said, it has been made apparent that our fathers brought with them to the western world the idea of a university as an institution superior to, though not exclusive of, a college, and that this idea, sometimes obscured by mist, has never lost its radiance. I have also called your attention to some of the functions which are embodied in the conception of a university: the advancement of learning, the conservation of knowledge, the development of talent, the promotion of spirituality, the cultivation of literature, the elevation of professional standards, and the maintenance of repose.

I add a few suggestions of a practical character which I hope will be approved in this seat of learning.

We should look for the liberal endowment of universities to the generosity of wealthy individuals. It is doubtful whether the national government, or the government of any State, will ever provide funds which will be adequate for the highest education. There is a growing disposition, in the Eastern States, to restrict all provision for public instruction to schools of primary and secondary rank. Were any legislative body to appropriate a sufficient financial support, there is nothing in the tendencies of modern politics to show that the representatives of the people, as they are in these days elected, would have the wisdom to mark out the pathway of a great university. Ecclesiastical zeal is more likely to be successfully invoked. The conception of a university pervaded by a spirit of enlightened Christianity is inspiring to the mind of

every believer. It seems to associate religion and science as co-workers for the good of man. It is more than probable, under this consideration, that a Catholic university will ere long be initiated; and if it succeeds, the example may lead to a union of Protestants for a kindred object. But it would be a misfortune and an injury, as I believe, to the religious progress of the country, if each of the denominations into which the evangelical world is divided were to aim at the maintenance of a university under its own sectarian name. The endowments which are called for are too large to be made up by petty contributions. Great gifts are essential, and consequently those who, in the favorable conditions of this fruitful and prosperous land, have acquired large fortunes, should be urged by all the considerations of far-sighted philanthropy to make generous contributions for the development of the highest institutions of learning. There is now in the golden book of our republic a noble list of such benefactors. Experience has shown no safer investments than those which have been given to learning—none which are more permanent, none which yield a better return.

It is a common error in this country to suppose that we need many universities. Just the reverse is true—we need but few, but we need them strong. There is great danger that funds will be scattered, teachers isolated, and scholars kept away from their proper fields, by attempts, of which we have seen too many, to establish postgraduate courses with very inadequate means. Even professional schools

have been initiated where the fees of the pupils have been the only criteria of success. We should lend our influence as scholars to enlarge the resources of the universities which are strong, and to discourage new foundations unless there is a positive guaranty that they are also to be strong. There are half a dozen or more places which could be named where a million dollars would be more fruitful than thrice that sum in any new establishment. No greater service could be rendered at this time than a rigid enforcement of the scriptural rule, "For whosoever hath, to him shall be given, and he shall have more abundance: but whosoever hath not, from him shall be taken away even that he hath."

There is another danger to which I will call attention—the danger of an incorrect conception of the purposes which should influence young men in pursuing university courses beyond a college curriculum. Those who have watched the tendencies of graduated students must have observed with a good deal of alarm the disposition which they sometimes show to concentrate attention upon very special subjects. Unfortunately, many of these persons are entirely dependent for their support on the salaries which they may earn. Now, instead of bringing to the educational exchange qualities which are always in demand and which always receive remuneration, they come forward as Doctors of Philosophy, with special attainments in some limited field, and are saddened to find that there is no demand for the acquisitions which they offer. I do not hesitate to say that, if the drift of university

work in this country is toward premature and excessive specialization, many a mariner is doomed to shipwreck on that rock. Even in Germany, where specialization has been favored, the cry is heard, Too many specialists, too many university candidates. It would be a misfortune to this country if we should find, in the course of a few years, a superabundance of men with rare acquisitions of a kind for which there is no demand. It would then be rightly said that our universities did not produce the fruit which had been expected. On the other hand, if residence in a university, beyond the college course, is found to widen the student's capacities as it increases his knowledge; if he learns the art of imparting what he knows, if he acquires the sense of proportion and sees the subjects which he studies with the right perspective, if he strengthens the foundations as he carries upward the obelisk, then he will gain and not lose by prolonged preparation for the duties of life. For every individual who may with wisdom be encouraged to devote himself to a very limited domain, there are scores who may be bidden to widen their culture. I do not now refer to those upon whom fortune has smiled, and who have the means to do as they please in preparing for life; but I have in mind many a struggling aspirant for the scholar's fame who would be a happier and a more useful man if he had not set his face so resolutely against those studies which adorn the intellectual character and give grace, dignity, and acceptability to their possessor. The first business of every man is to win

his bread; if he is sure of that, he may wander at his own sweet will through meadows and woods.

In all the difficulties which are encountered by those who are endeavoring to advance the institutions of this country to their highest usefulness, great encouragement may be derived from a study of the results secured in other countries and in other ages. It is only by the review of long periods of time that the most instructive lessons can be learned. The history of European universities is yet to be written by one who has the requisite vision, and who can estimate with an accurate judgment the various forces by which they have been molded, and the various services they have rendered to humanity. But there are many histories of famous foundations, many biographies of illustrious teachers, many surveys of literature, science, and education, many elaborate schemes of organization, and many proposals of reform. The mind of a master is indeed needed to coördinate what is thus recorded, to be the Interpreter of the House called Beautiful. But the American scholar need not wait for such a comprehensive work; the American philanthropist need not delay his benefactions until more experience is secured. The centuries speak with many voices, but they are all harmonious. From the revival of letters until now, from the days of Gerson, the great chancellor of the University of Paris, five hundred years ago, every advance in civilization has been dependent upon the influences which have proceeded from the seats of learning. Their light has illuminated the fore-

most nations of Christendom. In days to come, more than in days that are past, their power for good will be felt upon the interests of mankind. Let us hope and believe, let us labor and pray, that the American universities when they are fully organized may be worthy allies of the strongest and best foundations—steady promoters of knowledge, virtue, and faith.

THE SHEFFIELD SCIENTIFIC SCHOOL OF YALE UNIVERSITY, NEW HAVEN

A SEMI-CENTENNIAL DISCOURSE, 1847–97

OCTOBER 28, 1897

I should be the last to forget or disparage the services of unknown benefactors. These have in a large degree made life for us what it is. These have their own commemoration when we recall the progress of the ages.

But there are others who stand out as leaders, as representatives. Gifts, labors, thoughts of distinguishable ancestors go to swell our spiritual patrimony. It may have been by some conspicuous work which was nobly spread over a lifetime; it may have been by some sweet trait which was just seen in a crisis of trial; but here and there they have helped us, and if we are to enjoy the fullness of their service, we must solemnly recall it.

In doing this we arrogate to ourselves no authority of final judgment by grateful celebration.

BISHOP WESTCOTT.

THE SHEFFIELD SCIENTIFIC SCHOOL OF YALE UNIVERSITY, NEW HAVEN

THIS is the hour for congratulation and recollections. It is our privilege to look backward over the path of half a century and to trace the steps, often slow but never devious, by which the penniless, nameless, and homeless offspring of an ancient and vigorous stock has attained commanding influence, rich in possessions, beloved by thousands of followers, honored wherever known, and still, with the fresh enthusiasm of youth, aiming at lofty ideals, attractive as the face of nature, varied and comprehensive as the laws by which this world is governed.

It would be easy, and it might be profitable, to engage in an exclusive commemoration of those who have made this institution, and to bring forward reminiscences of incidents and events—some of them truly romantic—which illustrate the progress of its remarkable life; yet the dignity of this

assembly, the presence of so many persons from a distance, and the relation of the Sheffield School to higher education in the United States forbid such limitations. You must therefore permit me to give a subordinate place to those sentiments which are uppermost in our hearts,—congratulations mingled with affection and gratitude, and with vivid memories of those who have departed, —while I try to do justice to their wise and assiduous labors by showing their relation to the times and to the progress of science in the latter half of the nineteenth century.

If the Antiquary should now appear, you would be sure to remember that his task has already been well performed; and if I should assume the garb and chisel of Old Mortality, you might remind me that the moss has not yet gathered upon the inscriptions in yonder cemetery. While Argus and Briareus, the one for the university and the other for the school of science, are on the alert, it requires some assurance to traverse the annals which they have collected; and yet this discourse must be historical. So in face of difficulties, enhanced by the distance which has separated the speaker from these once familiar scenes, from muniments and archives, I enter upon the duty of the hour, conscious of the honor received from your courtesy, and grateful for an opportunity to stand once more among former colleagues, pupils, and friends.

To a returning wanderer it is a delight to see this favored university renewing its youth at the approach of its second centennial anniversary—

more comprehensive, more useful, more liberal, and more worthy than ever before of loyal affection and support.

EIGHTEEN hundred and forty-seven is the year of our nativity. But there was a prenatal existence worth remembering. Truly, Yale College has always stood for science, and therefore it is no wonder that those who initiated the department of philosophy and the arts, just after President Woolsey assumed the chair, had faint notions of the importance of their proceedings. They were quite unconscious of developing new forces. Mr. Bryce, in his sketch of the Holy Roman Empire, remarks that the year A. D. 476, which school-boys are taught as one of the most important dates in everybody's chronology,—the downfall of the Roman Empire,—was no such date to those then living as it has since become, nor was any impression made on men's minds commensurate with the real significance of the event. So it is in our academic chronology. As conclusive evidence, recur to this modest announcement originally made in the catalogue of 1847:

> It has long been felt at Yale College to be important to furnish resident graduates and others with the opportunity of devoting themselves to special branches of study either not provided for at present, or not pursued as far as individual students may desire.

Accordingly, the department of philosophy and the arts is established. By this simple decree the system of graduate studies now in vogue throughout

the land was formally inaugurated. Moreover, an inconspicuous postscript states that

> Professors Silliman and Norton have opened a laboratory on the college grounds for the purpose of practical instruction in the applications of science to the arts and agriculture.

Thus was born the Sheffield School, with the inheritance of an opportunity, a desire, a hope, and a belief, supported by an empty purse and slight expectations.

> That primal age which did as gold excel
> Seasoned its acorns with keen appetite,
> And thirst to nectar turned each springing well.

To illustrate the evolution of this idea, then first produced among us, to show what ingredients it included, what unexpected nurture it received, what storm and stress it survived; especially to show that this idea was planted in fertile soil by the spirit of our age, the *Zeitgeist*, believing and delighting in the study of nature and her laws, we must consider the state of mankind in the middle of the nineteenth century, and the conditions of liberal education then prevalent in the United States and England. No milestone marks the transition from the old to the new, yet the older men among us must be conscious that this is a very different state of society from that of 1847. The education, the creeds, the industries, the commerce, and of course the science and the arts of civilized countries are changed. This is a freer, busier,

wealthier, more complex, and indeed a wiser and happier world than that of our fathers—before the gold of California and Australia and the diamonds of South Africa had been discovered; or the magic spark, flashing over land and sea, had transformed the usages of domestic life and the processes of international intercourse; or the life-giving agencies, the heaven-sent blessings of anæsthesia and antisepsis, had removed from the bed of pain apprehension and distress.

It was the middle of this century when the doctrine of evolution, which has pervaded every branch of natural history and extended its influence to medicine, anthropology, sociology, and history, was publicly set forth—a period, as a recent historian has shown, in which a doctrine that may be traced to Empedocles, Heraclitus, and Aristotle found its "perfect expression" in the writings of Charles Darwin. On the evening of July 1, 1858, a day almost as memorable as that when the island of Guanahani was revealed to Columbus, the epoch-making papers of Darwin and Wallace were read to the Linnæan Society of London; but it should not be forgotten that, sixteen years before, Darwin had written out a sketch of the "Origin of Species," and with wonderful self-control had kept it in his portfolio while he gave eight patient years to the study of barnacles. We have the authority of Sir Archibald Geikie for saying that the two geological chapters in the "Origin of Species" produced the greatest revolution in geological thought which has occurred in our time. It was in 1860 when

Herbert Spencer announced the program of his philosophical system; but nine years earlier he had printed a volume entitled "Social Statics, or the Conditions Essential to Human Happiness Specified and the First of Them Developed." Lyell had been for a long while the leading authority of England in the science of paleontology, but the startling book in which he demonstrated the antiquity of man did not appear until five years after the publication of the "Origin of Species." This is not the place to discuss the far-reaching and all-pervading influences which proceeded from these writings, nor to dwell on the controversies they evoked, such as those with which we are familiar between Agassiz and Gray; but I bring these instances forward as indications of the extraordinary intellectual vitality of the middle of the nineteenth century, and of the changes in human thought of which this school has been the watchful observer.

I have the authority of an eminent naturalist for saying that "the most significant aspect of this movement is the general recognition, by all thoughtful men, of the proof which was afforded, by the progress of discovery, of the truth that the unity of all nature is orderly, and discoverable by scientific methods."

In the domain of physics, changes have occurred almost as remarkable. The doctrine of the conservation and correlation of forces, beginning with a determination of the mechanical equivalent of heat, was suggested and developed between the years 1842 and 1862 by Mayer, Grove, and Joule.

Faraday was then at the zenith of his powers, Helmholtz and Kelvin at the outset of their illustrious careers. But it was as far back as 1830 when Joseph Henry, then a schoolmaster in a country town, reached those discoveries in electromagnetism which made the telegraph a proximate certainty and brought into the intercourse of mankind a revolution almost as great as the primitive invention attributed to Cadmus. Spectrum analysis, that powerful agency which reveals the constituents of incandescent bodies, even the chemical and physical nature of the remotest stars, was then unknown.

Likewise glance at mathematics and astronomy fifty years ago. Laplace had been dead for over twenty years; Gauss was living in an advanced age; Sir William Rowan Hamilton had announced, but had not published, the new calculus—quaternions—which was to give him high rank with the greatest mathematicians; Cayley, Sylvester, and Hermite were at the portal of those investigations which have made their names illustrious in the science "which never takes a backward step." The abstract reasonings of such men are beyond the apprehension and appreciation of minds non-mathematical; but this is not true of astronomy, for every human being, the wayfarer and the shepherd as truly as the philosopher, is interested in the progress of celestial science. No purely scientific discovery within our memory has made such an impression on the popular mind as that of the planet Neptune, whose existence, foretold by Adams and

Leverrier, was demonstrated on the night of September 23, 1846. Then the astronomer of Berlin turned his lens, by request, to the predicted place, and first recognized as a planet that vast orb which had been circling in solemn silence, for countless ages, thousands of million miles from the sun. This superb achievement, like the torch-bearer of Aurora's car, was the precursor of a long series of splendid additions to astronomical science, as well as of great improvements in the telescope and of great endowments for astronomical research.

But unexpectedly a new astronomy has supplemented the old, and celestial physics is standing side by side with celestial mechanics as the interpreter of the mysteries of the universe. Surprising as was the revelation of Neptune, wonderful as are the maps of the heavens and the calling of the stars by their names, it is more remarkable that astronomy can now tell us the constituents of every heavenly body. This is the triumph of spectrum analysis, already mentioned, the contribution of chemistry and physics to astronomy, an inevitable evolution from the researches of Kirchhoff and Bunsen, in 1859.

I am in danger of multiplying these fascinating allusions, and of trying to give in a single page an abstract of a cyclopedia, which would be the task of Icarus, predestined to fall; but mention must be made, if it be only with a word, of recent advances in some other departments of science. Think of geology, including paleontology on one side and petrography on the other; of chemistry, with its

revelation of new elements, leading up to the Neptune-like discovery of argon, and with its innumerable contributions to agriculture, metallurgy, and pharmacy, to color, food, and flavor; of engineering and mechanics, with their acquired control of force and matter, in ordnance, ships, dynamos, engines, bridges, tunnels, and air-ships; of the sciences of metallurgy, meteorology, geodesy, exploration, navigation, and aërostatics. It is truly a half-century of marvels, proceeding from the patient, unrequited, unseen pursuit of science by men of extraordinary ability and of absolute concentration on the advancement of knowledge. By common consent, it is the age of electricity, and the history of that single branch of science verifies a saying of Faraday's, which was early adopted in this school: "There is nothing so prolific in utilities as abstractions." But every science has made its contributions to the advancement of the race, and every advance has made more obvious the mystery of existence and increased the humility of man as he thinks of that which transcends his reason. As "knowledge grows from more to more," so "more of reverence in us dwells,"

> That mind and soul, according well,
> May make one music, as before,
> But vaster.

Different minds will place different estimates on the intellectual accomplishments of these recent years. In ordinary conversation the men of the mart will point to an Eiffel tower, a suspension-

bridge, a continental express-train, a man-of-war, an Atlantic cable, or a great exhibition. On the other hand, scholars of the lamp, like Freeman, will give precedence to the comparative method of study now employed in history, language, politics, economics, and religion. But in this assembly may I suggest that perhaps the greatest triumphs of the intellect during the last half-century are these five contributions to human knowledge: the establishment of the principles of evolution; the establishment of the principle of the conservation of energy; the development of mathematical science, and its application to physics, mechanics, electricity, and astronomy; the development of spectrum analysis, and the consequent discoveries respecting light and electricity; and the discovery of the nature and functions of bacteria, and of their influence, for weal and woe, upon living organisms? To these may be added, perhaps, the birth of experimental psychology, a child so young that, though it seems to belong to the family of Hercules, its strength has not been fairly tested.

It is time to turn from the aspects of science to those of education. Prior to the days of Faraday, Darwin, and Huxley, of Agassiz, Dana, and Whitney, the classics held their sway and controlled with almost absolute supremacy the liberal education of England and the United States. The benefits of instruction in Latin and Greek, enormous as they are, received exaggerated praise, in spite of the dictum of Sir William Hamilton, which was often quoted, that nothing brought the classics into such

disrepute as requiring them of every student. To enforce this statement it is not necessary to appeal to the opponents of classical culture. The words of a renowned scholar, distinguished for his knowledge of antiquity and his love of the ancient landmarks, tell the story well. The classical revival, says Freeman, "in all its forms and stages, fostered the idea that the languages, the arts, the history of Greece and Rome, at certain stages of their being, were the only forms of language, art, and history which deserved the study of cultivated men. It led to the belief, not perhaps fully put forth in words, but none the less practically acted on, that those two languages, and all that belonged to them, had some special privilege above all others; that the studies which were honored by the ambiguous name of 'classical' were fenced off from all others by some mysterious barrier; that they formed a sacred precinct which the initiated alone might enter, and from which the profane were to be jealously shut out. Such a state of feeling, a feeling which has even now far from died out, could not fail to lead to mere contempt, and thereby to mere ignorance, of everything beyond the sacred pale. And what is more, it hindered any knowledge of the true nature of those things which were allowed a place within the sacred pale. It led to a cutting off of so-called 'classical' studies from all ordinary human pursuits and human interests."

To a very considerable extent this reproach, if it is a reproach, is likewise American. The

opportunities, the honors, the pleasures, and the rewards of a liberal education were opened during the first half of this century to those only who had been disciplined, by the preparatory schools, in the ancient languages, and this discipline was continued through the greater part of the subsequent collegiate curriculum.

To verify this remark it is only necessary to examine the catalogues of the leading colleges of this country during the first five decades of this century, or to read the defense of classical studies annually printed by Yale College for twenty-five years prior to 1854. Spasmodic efforts were made for the foundation of new courses, but virtually West Point and Troy were the only established places in this country for good technical instruction so late as 1847. Whitney was so conscious that the men of letters, the group to which he belonged, depreciated the aims and objects of scientific education that he wrote a pamphlet which silenced, if it did not remove, the prejudices of all who read it. Its reperusal at this time is invigorating.

But for twenty years previous to 1847 a force had been at work in a little country town of Germany destined to affect the education of Christendom, and at the same time to enlarge the boundaries of human knowledge, first in chemistry and the allied branches, then in every other one of the natural sciences. The place was Giessen; the inventor, Liebig; the method, a laboratory for instruction and research. Dr. William H. Welch has lately

reviewed in an address at Philadelphia the results which proceeded from this innovation of a genius.

Another event contributed to the expansion of education. About the middle of the century the first World's Fair, held in London, had revealed to English-speaking people the increasing supremacy of Continental nations in those branches of industry which depend upon the applications of science. The British were alarmed. The papers of the day, and especially the London "Times," were vigorous in calling for improved methods of public instruction, and especially for the better guidance of chemists, miners, engineers, geologists, and manufacturers, for all who aspired to be leaders in the technical pursuits upon which the prosperity of the British empire depended. Hence in close connection, though not in this order, came the department of science and art and the museums at South Kensington, the great provincial colleges of science, the Cavendish laboratory at Cambridge, the new museum at Oxford, and other noteworthy advances. From that day to this scientific education in England has been making progress, although Germany and France and other Continental states still hold their ascendancy; for now, as then, the laboratories of those countries and the abundant encouragement given to scientific research by their governments excite the admiration of our mother-country and ourselves.

Is it not apparent that in the middle of this century responsibility for the advancement and diffusion of knowledge was wider and deeper than ever

before? Imbued by this spirit of the times, Smithson made his famous bequest, soon to be followed by similar and greater gifts from others, a splendid line of endowments, which has spread with advancing civilization from Massachusetts Bay to the land of the Golden Gate.

Geographical discoveries, previously confined to islands and coasts, or to narrow lines in desert or barbarous countries, now began to assume continental magnitude. Earth, air, and sea, and even celestial space, were called upon to reveal their secrets. The importance of accurate measurements having now been completely established, instruments of precision became more perfect, complex, and varied, produced by a noble army of inventors who never dishonored the drafts which were made by science on the bank of mechanical ingenuity. Mathematics formed a close alliance with construction and invention. Improvements in lenses and their mountings, as shown in telescopes, microscopes, and many other -scopes, and the invention of concave gratings, were among the fruits of this alliance. Astronomy, physics, mechanics, and engineering renewed their strength. Natural history went beyond the limitations of system. Publications were multiplied; new associations were formed, national and international. Specialization took the leadership, and before Humboldt died, the era of general scholarship was past, the new era was fairly under way.

In all this progress the dominant note has been the advancement of science, and not the accumula-

tion of wealth; truth, and not personal gain. Why did Darwin and Dana engage in intellectual toil in the intervals of physical disability? Why did Faraday abandon "commercial work" at the moment when it promised great returns? Why had Agassiz "no time for money-making"? Certainly not because they despised the ease of life, but because personal gain was nothing compared with the study of nature and the advancement of knowledge. Wisdom was more than gold. Moreover, an unselfish desire to enlarge the welfare of mankind has been a powerful stimulus to the ablest men. If I name the discoveries of anesthetics and antiseptics, with the subordinate yet very significant evolution of cocaine, the applications of electricity, the improvements in hydrography and in navigation, the growth of preventive medicine and the science of hygiene, and the alleviations of surgery, you will be reminded that science repays with ample usury the advances made to her account.

In this splendid epoch of intellectual progress, brilliant and memorable as the revival of letters, the early days of the Sheffield School were passed. An alchemist looking on might have asked what philosopher's stone could produce that amount of the precious metals which would be indispensable for the success of a school devoted to such aims; but his brother, the astrologer, casting the horoscope, would have replied that resolution can do more than gold, and enthusiasm than much fine silver.

Thus we reach the conclusion that this celebra-

tion is significant, because, among the institutions created during the last half-century for the promotion of scientific research and education, the Sheffield Scientific School of Yale College has held an honorable place. It is this relation to the progress of human development that gives importance to the day of small things, and dignity to transactions which by themselves might be insignificant were they not governed by enlightened views, so presented, advocated, and maintained that their influence has been powerful.

As I proceed to speak of the organization of this school I shall not attempt to distribute the laurels among those who took the leading parts; but one of them, Benjamin Silliman, long the scientific Nestor of this community, dear "Uncle Ben," admired and honored, is entitled to our first grateful mention, not only because of his power of interesting the public, and his perseverance in maintaining the "American Journal of Science," but for his personal instruction, during many years, of unenrolled young men who enjoyed the limited opportunities of his primitive laboratory and the benefits of a great, then unrivaled, collection of minerals. Silliman had prepared the way for the School of Applied Chemistry; and Woolsey, becoming president of the college, fresh from studies abroad, caused the scheme to be so broadened that it became the department of philosophy and the arts, akin in scope and spirit, though not equal in resources, to the great foundations of Europe, like Bonn, Göttingen, and Berlin, with which he was familiar. It

must have been a great satisfaction to the revered ex-president, nearly thirty years afterward, to utter, on a public occasion, these words, doubly valued by his hearers, because they came from one who knew the circumstances, and from one who was always guarded in the bestowal of praise. "From the first," he said, "the professors have struggled against probabilities. They have worked by faith. They have aimed to have a school, sink or swim, worthy of the science of this country. As a result, I think there is, confessedly, no other school of this character, in this country, which is on a level with this. I would give equal honor to the devotion of the professors and to the munificence of the giver."

Here let me remind you of a fact not generally known, though clearly recorded. As far back as 1814 resident graduates were enrolled as a distinct class on the Yale catalogue, and in 1819 and 1820 the numbers so enrolled were thirty and thirty-one. This shows that the beginning of graduate studies in this university antedates by more than thirty years the department of philosophy and the arts.

In 1846 two young men, devoted to applied science and ready for careers, were made by Yale "university professors." It is a striking coincidence that Harvard and Yale, generous and friendly aspirants for the leadership, caught the laboratory quickstep at almost the same time. The gift of Abbott Lawrence, made in 1847, led at once to the appointment of the great Agassiz, and almost immediately to the opening of a chemical labora-

tory, organized by Professor Horsford, a pupil of Liebig.

One of the two young professors at New Haven, having an inherent love of agriculture, and an excellent preparation in Edinburgh and Utrecht, was qualified to direct a chemical laboratory and to give instruction in the sciences pertaining to agriculture. Professor John P. Norton was fully possessed by the spirit of modern science, and soon gathered around him a company of young chemists, some of whom were destined to win the highest distinctions, three of them still students, colleagues, and teachers, now present with us, strong in attainments, influence, and character, stronger still in the affection of their pupils.

The second of the original appointments was that of Benjamin Silliman, Jr., a man of enthusiasm and energy, and of boundless hospitality, intellectual and social, whose name and address, quick sympathies, and interest in applied science gave promise of great usefulness. The labors of both these men were soon interrupted. One was diverted to other fields of activity in Louisville and New York; the other died at the threshold of his fame. I have often thought what a difference it would have made if the school had then been endowed. Norton, trying to do double work at Albany and New Haven, fell a victim to the exposures of winter travel; and Silliman was led to seek remunerative occupations elsewhere. Those were the days of which Lounsbury thus speaks: "The college had no money to give, but even if it had it is more than doubtful if

it would have given it. No one at that time, however enthusiastic, ever dreamed of the supreme importance which the natural sciences were soon to assume in every well-devised system of education. The impression prevailed that chemistry, like virtue, must be its own reward."

The youth of this school was spent like a foundling's; its future was precarious. At length new forces came to its support. Certain obstacles, elsewhere encountered, made it easy for Professor William A. Norton to bring to Yale his classes in civil engineering, and he was followed by his colleague, Professor John A. Porter, then devoted to chemistry. These appointments were invigorating. Norton was an admirable teacher, well trained at West Point, painstaking, accurate, thorough, well acquainted with the progress of his favorite science, and always commanding students of ability. Porter, who had been a pupil of Liebig, was a man of letters as well as of science, a poet, philosopher, and patriot, thoroughly believing in the new education, as President Eliot named it, and ready to enlarge by the various influences at his command the scope of the Scientific School, of which he became for several years the able and eloquent exponent.

Rapid growth followed, due chiefly to one man, whose name, before all others, is on our lips as the founder of this school—Joseph E. Sheffield. It is needless to recount the steps from a gift of five thousand dollars to the amount of a million, with which we are familiar. Naturally the school looked up to him as a father, and asked permission to bear

his name. He consented with reluctance, but he never forgot the child once adopted, and in the final distribution of his estate made it equal with his sons and daughters. The year of christening was 1860.

Mr. Sheffield was a man whom future generations, like the present, may delight to acknowledge and honor as a founder. Nothing will ever be revealed about him that his school will wish to cover. On the contrary, if those who knew him best would utter what they know, the world would admire even more than it does now the sagacity, the modesty, the consideration, and the unselfishness of our great benefactor. His liberality grew with the growth of the school. It was shown in little things and in great; in the payment of current bills, in the provision of large funds. "I get my reward every day as I look out upon that workshop," was the answer that he made to an expression of gratitude. "No investment pays me so well," was another of his remarks. "I wish you to bear in mind," he once said to Professor Brush, "that you have never asked me for a dollar." Yet with all this growing interest, and with his readiness to listen to all the inside history of the school, he never to the slightest degree interfered with its affairs. He trusted the governing board. He knew more intimately than any member of the corporation the plans, the wants, the success, and the limitations of the school, and to the utmost of his ability he contributed to its maintenance. An intimacy which continued for more than twenty years between the chief ex-

ecutive of the school and its nearest friend was never clouded by a moment's disagreement. His only regrets were the limitations of his resources. To all these engaging traits must be added the remembrance of his strong intellect, his comprehensive charity, his integrity, gentleness, and faith. Happy the school that can bestow love as well as gratitude upon the memory of its chief benefactor.

Such example is contagious. No one was surprised when neighbors, townsmen, and friends at a distance, one after another, in many successive years, enlarged the endowment: Farnam, the lifelong colleague of Sheffield; Norton, the father of the agriculturist; Wheeler, an enthusiastic graduate; English, senator and governor, promoter of studies in law, history, and science; Phelps, whose gateway adorns the campus; Winchester, founder of the astronomical observatory, who, like the "embattled farmers" at Concord, has "fired a shot heard around the world," and whose widow has given to the school one of its most important halls; Collier, who perpetuated, by a fund, the memory of his departed brother; and a lady of Liverpool, Mrs. Higgin, who established a professorship; besides Fellowes, Boardman, Sampson, Dodge, and many more. By their encouragement the school was doubly strengthened, for during the lifetime of its chief benefactor every such gift brought another from him. Since his day, the munificence of Mrs. Winchester and the bequest of Mr. Fayerweather are indications that new friends have arisen to strengthen these foundations.

The relations of the school to the State began after the federal government, by the Morrill Act of 1862, distributed among all the States a certain amount of land-scrip for the promotion of scientific education. Connecticut gave the income of its portion to the Sheffield, and although the amount annually received from this source was not large, it seemed so, and was accepted as a token of public confidence most timely and encouraging. This disposition was good for the State and good for the college, and fully justified the action of Governor Buckingham and those who concurred with him in advocating this appropriation. A long line of governors from his time onward testified to the value of such an arrangement. Its termination, after almost thirty years of harmonious union, is much to be regretted among the unfortunate annals of divorce.

Soon after the reception of this grant, several members of the faculty entered upon an educational campaign, which can hardly be brought to mind, in a retrospect of this long interval, without provoking a smile at the enthusiasm of youth and at the "expulsive power of a new affection." The principal towns of the State were visited, and the chief men of the tribes were assembled to hear of the new education. Sometimes in lecture-rooms, frequently in private parlors, once in a court-house, once in the governor's room at Hartford, and once in a fire-engine room, the story was told with the earnestness of conviction, if not with the graces of eloquence, and with the certainty, not of history,

but of prophecy. Dana, a constant friend, had inaugurated the campaign some years before by a public address. Whitney's "Aim and Object" was distributed freely as a campaign document; and the newspapers, always responsive to the claims of the school, echoed these professorial utterances in villages and byways. The school did not reap much money from the farms or mills, but it made hosts of friends, whose favor has never departed. One of the most valued was the revered Horace Bushnell, and Governor Hawley was another.

But why should further extracts be read from the book of chronicles? Let us rather consider the significance of the circumstances, gifts, sacrifices, labors, methods, and suggestions which have made the Sheffield School.

From the beginning onward this institution has been a department of a university, of a university which never suffered its love of letters to blind its eyes to the value of science. In the days of closely restricted income, during the first half of the century, chemistry, mineralogy, geology, botany, mathematics, physics, meteorology, and astronomy were taught in Yale. Nor will any one think that scientific research was undervalued if he recalls the preparation of Dana's "Mineralogy," the light that was thrown on meteoric showers, the studies of the aurora and of the zodiacal light, and the search for an intramercurial planet. Very different would have been the Sheffield record if it were not associated with the fame, the fortune, and the followers of a greater alma mater. Substantial advantages

were bestowed by the mother upon her child—the use of the library and of the cabinets of mineralogy and geology. The Peabody Museum, the Winchester Observatory, with its far-famed heliometer, and the Street School of the Fine Arts shed their light, like the sun, on all the university; but the gift of George Peabody especially contributed to the growth of a school in which mineralogy, geology, and zoölogy were prominent subjects of instruction.

Still, Sheffield has not been held by the leading-strings of its mother. It has had a large amount of independence. Its funds, buildings, appointments, have been its own. The professors have been its governing board, controlling its courses and its funds, subject to the oversight of the president and fellows. On one occasion, at least, the faculty asked permission of the astonished corporation to reduce their own salaries, and the request was granted!

Thus it has come to pass that no "conflict of studies" has been heard of; no hostility between science and letters; no "warfare" between science and religion. The Sheffield School has always stood for the idea of a liberal education in which scientific studies should predominate, but in which a moderate amount of Latin and of modern languages is required; history and economics are also taught. It is memorable that for a long period the greatest of American philologists was the daily instructor in French and German; and that the most learned study ever made of Dan Chaucer and his "well of English undefyled" proceeded from a Shef-

field chair; and that no American professorship of economics or statistics has been more prolific and stimulating than that which was held for many years by one but lately brought to the end of his career.

Slight perturbations in the academic and scientific orbits might interest a great astronomer like Newcomb, but to the ordinary observer they were as imperceptible as the influence of Neptune upon Uranus.

Dr. Michael Foster, the English physiologist, in a recent address has called attention to the fact that the increment of human knowledge transcends the power of man to assimilate it. This is most obvious when a course of preliminary education is considered. So many subjects are said to be "of the first importance," so many are "indispensable," that, like new wine in old bottles, they have burst the curriculum of our fathers and overtaxed the capacities of youthful recipients. Elective systems, costly, vexatious, and antagonistic to time-honored traditions, must now be provided in every college and institute of technology. It is one of the glories of the Sheffield that from the beginning students have here been permitted to choose a group of studies, the constituents of which were beyond their choice. "Freedom, under control," has been the rule of the house. Moreover, these groups have not been set forth as professional courses, but as ladders leading up to special callings, as preliminary to modern professions and technical pursuits. One of the most advantageous of these courses has

been preliminary to medicine. To follow the healing arts, which have made during the last half-century such wonderful advances, discipline is requisite in physics, chemistry, physiology, with prolonged laboratory practice and increasing familiarity with the normal functions of organic life. Such courses were projected here five-and-twenty years ago, and gradually the medical colleges are discovering their value. The Johns Hopkins Medical School, for example, allows no student to enter as a candidate for its four years' course unless he has had such a training, substantially, as that here offered many years ago, and never so advantageously as now. Names might be cited of eminent physicians, leaders in physiology, pathology, physiological chemistry, and hygiene, who received their bent from the preliminary medical course of the Sheffield School.

In the matter of degrees, it is not possible to distinguish between the requirements of the school and those of the department of philosophy and the arts; nor is it important, for the greater includes the less. Certainly Yale and Sheffield are entitled to the credit of introducing among American institutions the degree of Doctor of Philosophy, demanding for it a high standard of attainments, and never bestowing the honor (not in a single case, so far as I can remember) by any irregular promotion. This degree has proved a powerful incentive to scholarship in this and other universities, and the list of *laureati Yalenses*, beginning, in 1861, with three distinguished names, soon followed by one of

the highest renown, is a list to be proud of.[1] It is also noteworthy that the school has never yielded to the American tendency to multiply the forms of the baccalaureate degree, a multiplication almost as bad as tampering with the coins of the realm.

A large amount of freedom has been given to the students outside of the halls of learning. Twice an application was made for places at daily prayers in the college chapel for scientific students; but none were provided, doubtless because the building by tradition and in construction was a collegiate and not a university chapel, and not because the scientific students were considered "past praying for." There has been no common table, no dormitory, no regular general assemblies of officers and students; on the other hand, there have been no rebellions against authority, no disorder, no hostility toward the faculty, no apparent trend toward irregular life, no lack of college spirit.

In the annual catalogue for many years the same phrase has been employed to express the object of the Sheffield School. These are the familiar words:

> The Sheffield Scientific School is devoted to instruction and researches in the mathematical, physical, and natural sciences, with reference to the promotion and diffusion of science, and also to the preparation of young men for such pursuits as require special proficiency in these departments of learning.

By these double services this school is known. Indeed, if you would estimate the value of any in-

[1] In 1861, Eugene Schuyler, James M. Whiton, and Arthur W. Wright; in 1863, Josiah W. Gibbs.

stitution of learning, measure its breadth and its depth: its breadth as revealed in the number, distribution, and attainments of its pupils, by their success and renown; its depth as shown by contributions, direct and indirect, made by its faculty and graduates to the advancement of knowledge.

There is no recent statement of the occupations of Sheffield graduates; but the brief phrases of the triennial, and an extended personal acquaintance in places near and remote, justify the following assertions. Nearly two thousand men have here been graduated, and many more have been well trained, according to their aptitudes, in science and in the applications of science to the useful arts. Many of them have proceeded to higher degrees, or have entered at once upon places which led up to a participation in the construction of public works, the conduct of industrial establishments, the charge of mills, mines, surveys, and explorations, and the promotion of public health. Others, and some of the ablest, have entered upon the study of medicine. A large number have been called to chairs of instruction and investigation.

The earliest list of graduates was prognostic. Six of the seven Bachelors of Philosophy became teachers, of whom one was a geologist and an explorer of the Western territory, one the botanist of the California Geological Survey, and a third, one of the leading mineralogists of the world. Go to South Africa, or to Japan, or to Turkey, to California or any of the trans-Mississippi States, inquire into the work of the United States Geo-

logical Survey, scan the membership of the National Academy of Sciences, look at the faculty of Yale, of the Massachusetts Institute of Technology, and of many other colleges, and you will come at once upon the Sheffield men.

As an example of their activity, a most interesting story might be appropriately told respecting the adventures of a graduate of 1862 and his friend, in crossing the continent before the first Pacific Railroad was built, of their map of the Yosemite, and of their mountaineering in the Sierras, which culminated in the ascent of Mount Whitney. Then came the celebrated exploration of the fortieth parallel, and the subsequent organization of the United States Geological Survey, of which this distinguished scholar became the first director. Such achievements belong to the trophies of the school.

It is never easy, in a public assembly, to review the progress of science or to estimate individual achievements. Many important contributions have no characteristics which are of interest beyond the circle of experts, or even intelligible. The speaker is certainly disqualified from making such a review, or from weighing in a critical balance the services of the able men, his personal friends, who have constituted the faculty. Their presence may forbid him to utter their names; yet he ventures to recall some facts which are known even to the inexpert, and to allude to others which the modesty of the faculty might be disposed to hide.

I only allude to the vast contributions made to

science, in four of its branches, by James D. Dana, and to the extraordinary scholarship and fertility of William D. Whitney, lest I appear to be claiming for a part of the philosophical department that which belongs to the whole. The professorships which they held—due to one honored benefactor—were independent of the Scientific School. But no one should forget that Dana was for years enrolled on the list of the Sheffield instructors, that his lectures and field-excursions were always attended by Sheffield students, and that the impulse given to the school from 1855 onward was largely due to the encouragement and coöperation of this great naturalist, whose personal strength was fortified by his position in the college faculty. Nor can we fail to remember that Whitney, a scholar of distinction among the scholars of the world, was the daily teacher, the constant adviser, and the unfaltering believer in the Sheffield School.

You have been reminded that the analytical laboratory in the old white dwelling-house (the "lab" of our college slang) was the first, and for a time the only, "outward sign of inward grace" which was shown by the new school; even now the manifold activities of five great buildings do but magnify the importance of their elder departed brother. With increasing vigor and undiminished enthusiasm, the laboratory study of chemistry there begun has been prosecuted for fifty years, partly for its own sake and partly because of its relations to agriculture, mineralogy, metallurgy, and physiology.

Consider agriculture. These are the days when everybody is conscious that the welfare of the country, perhaps the stability of the government, is dependent upon "the crops"; but not everybody remembers, when he sees the heavily laden trains, the well-filled elevators, and the wharves burdened with wheat, cotton, and tobacco, that the national supplies are largely results of advances made by science. Every State in the Union now has its college of agriculture and the mechanic arts. It was not so when Norton came to Yale. He was a pioneer in the scientific agriculture of the United States, and with a longer life would have accomplished much more; for he knew how. He set the pace. When his mantle fell upon Porter, a student of Liebig, twenty-six leading agriculturists from every part of the country were brought to New Haven for a conference of many days; and it would not be difficult to show that this unique, primeval example of university extension had a powerful influence in promoting, on right principles, the study of agriculture. This was in 1860. It was estimated that five hundred persons from a distance came here to follow more or less of these lectures and discussions. Consequently came the national grant associated with the name of Senator Morrill, an enactment due in no small degree to influences here put forth. From this congressional bounty, Cornell, Madison, Minneapolis, Berkeley, and other universities of the Western States derive a considerable part of their revenues.

A pupil of John P. Norton soon took the leader-

ship in agricultural chemistry, and no one has outstripped him in the race.[1] His books, his suggestions, his scientific memoirs, his researches, and his personal influence have made the school famous. The list of his publications is a long one, but it is more remarkable when tested by qualitative than by quantitative analysis. One of them, "How Crops Grow," is almost as wide-spread as the vegetation it describes. Like "The Pilgrim's Progress," it is adapted to every clime. Early in the seventies the author began to advocate the establishment of experimental stations, and in due time had the satisfaction of seeing them established throughout the Union, while he became director of that in Connecticut. This achievement alone reflects great distinction on the Sheffield School. If it had done nothing but make and uphold this idea, its cost would have been repaid.

Closely associated in the promotion of scientific agriculture has been a different sort of mind, one whose unfailing resources, practical sense, and varied knowledge sometimes overshadow his ability as an investigator in four important branches of science.[2] He was long a wanderer on the Pacific slope, collecting plants and experience, climbing mountains and difficulties; but he returned to New Haven at the regeneration of the school in 1864–65, and his post-exilian studies have been directed to heredity, the evolution of breeds, and the transmission of acquired characters, and to the conditions of public health.

[1] Samuel W. Johnson. [2] William H. Brewer.

of Yale University, New Haven

New Haven has been a center of mineralogical inquiry during the entire century. Its collections, which began with the famous candle-box of Professor Silliman, were augmented by the cabinet of Colonel Gibbs, and have grown into the varied and comprehensive possessions of the Peabody Museum. These collections inspired the renowned treatise of James D. Dana, whose work has been extended and made more complete by able followers connected with this school. Important contributions to the science of mineralogy, involving a great amount of accurate discrimination, were modestly put forth year after year by the director of the school as supplements to Dana's work.[1] New localities were visited, and old localities were revisited, always with good results, not only in beautiful specimens, but also in positive contributions to science. His absorbing administrative duties have not dimmed his enthusiasm nor abated his energy. He is one of those men, rare at any period, who carry on the most special investigations in their own domain, while they show a broad sympathy with other workers, and a great capacity for perception, suggestion, encouragement, and aid.

So in geology. Able investigators, whose observations and publications have been important, have gone hence to other institutions; but there is among us an illustrious and world-renowned investigator who has never been enticed away as a professor, but who as an explorer penetrated regions before unknown in the far West, and who brought from

[1] George J. Brush.

them treasures as marvelous as if he had carried in his hand the lamp of Aladdin.[1] As a scientific writer, he has surpassed himself as a scientific explorer; for these brilliant discoveries were interpreted with masterly ability and patience, and have been put before the world in the best of form, chiefly at his own expense. The fossil horse, *Hippus*, and his more ancient precursors, with their two toes, three toes, and four toes, ancestors of the racers of to-day, and his "birds with teeth," have become classical illustrations of the evolution of higher animals, and are famous; but it is not so well known that a thousand species of extinct vertebrates have been brought to light by this great discoverer, many of them of the highest significance in their lessons and suggestions.

The study of zoölogy has been renovated during the history of this school. The value of classification has not depreciated, while that of embryology, morphology, and physiology has become more apparent. The senior biologist has extended his operations over a vast area and to the uttermost depths of the ocean.[2] Modest, learned, patient, and thorough, he has described the marine fauna whose existence has been brought to light by systematic dredging. One hardly knows which is the more wonderful, the limitless numbers or the varied structures of new species which he has introduced. An able colleague, concentrating his attention upon the *Crustacea*, though not exclusively, carries on and extends the investigations which gave to Dana no small part of his early renown.[3]

[1] O. C. Marsh. [2] Addison E. Verrill. [3] Sidney I. Smith.

Nor was zoölogy the only department of natural history here promoted, for a chief authority in one branch of botanical science, including ferns and seaweeds, was here distinguished as a collector and writer. This day his name is inscribed upon a tablet placed with his books and herbarium in a memorial room.[1]

In the various branches of engineering science, civil, mechanical, and dynamical, the school has always maintained a high reputation. Long ago the head of this department investigated with ability, ingenuity, and patience the nature of comets and the principles of molecular and cosmical physics; and at an earlier time he made an important series of investigations upon the set of wood and metals after transverse stress.[2]

In later days, another accomplished West-Pointer, who is said to have been the first to suggest the cantaliver bridge, was distinguished for his work upon steam-generators and other prime motors. They were followed by other able engineers who were skilful in the advancement of their science, as well as in its applications. One of them has produced a treatise upon strains in framed structures (not to speak of his other writings), which is everywhere accepted as an original authority.[3]

Whatever else is omitted from this imperfect sketch, I must not fail to remind you that improvements in the instruments of research are among the most important possible contributions of in-

[1] Daniel Cady Eaton. [2] William A. Norton.

[3] William P. Trowbridge, Augustus J. Dubois, and Charles B. Richards, whose parts are readily distinguished.

genious men to the advancement of knowledge, and that an improvement has here been made in the manufacture of lenses—those powerful agents in every field of optical inquiry—by one who was once a student and is now a professor in this institution. By a masterly study of the mathematical laws, and a practical application of those laws, which called at first for extraordinary patience, methods of producing lenses were devised which have been pronounced successful by a company of eminent astronomers, and have been widely adopted.[1]

Physiological chemistry is one of the latest additions to the subjects here taught. At once, in this department, the school has risen to the foremost place. Nowhere else in this country, not in many European laboratories, has such work been attempted and accomplished as is now in progress on Hillhouse Avenue, unobserved, no doubt, by those who daily pass the laboratory door, but watched with welcoming anticipation wherever physiology and medicine are prosecuted in the modern spirit of research.[2]

The younger workers in this corps may say that the speaker is not as familiar with the doings of these later years as he is with those of an earlier day. Unquestionably this is so; but there is this consolation, that another voice, at another time, will then do them ample justice. *Seniores ad honores, juniores ad labores.*

This review has suggested a gallery of portraits which ought to be drawn by some Rembrandt of

[1] Charles S. Hastings. [2] Russell H. Chittenden.

the pencil or the pen before the characteristics are forgotten. At the gateway of Trinity College, Dublin, stand the figures of Edmund Burke and Oliver Goldsmith; in the antechapel of Trinity College, Cambridge, the statues of Isaac Newton and Francis Bacon. I would not compare our worthies with those of any other college, or ask for them all the portraiture of marble and bronze; but I would emulate the example so common in old countries of honoring in the places of their activity illustrious men. Not to mention those now living, how many pairs there are whose portraits might be pendants! Tablets, busts, paintings, or etchings should be placed in honor of them all.

Whitney and Dana, well described by the Master of the House in his memorial discourse, and entitled to distinction as philosophers both, renowned throughout the world; John P. Norton and Benjamin Silliman, Jr., the two young chemists who perceived so distinctly the needs of the times; William A. Norton and John A. Porter, who invigorated the school in a critical moment by their presence and their instructions; Lyman and Trowbridge, promoters of the mechanic arts, able to apply their mathematical abilities to practical affairs; Eaton, the lover of nature and the interpreter of hidden laws of life; and Walker, the far-famed economist and statistician, the soldier and the patriot—all these have gone over to the majority, leaving the School rich in the remembrance of their abilities, services, influence, and devotion. Three of the earliest students are still connected

with it, strong, honored, and rewarded for lifelong adherence to noble ideals. Around them are scores of juniors, just as vigorous, just as hopeful, just as gifted, as those by whom they have been taught. May gratitude and honor reward them all.

I have lately heard this story: A certain king, instituting a brotherhood, promised all who would join it marble monuments which should be placed in rows upon the sides of an aisle. "A hundred years hence," he said, "you will see that the effect will be fine." "Thank your Majesty," said one of the brothers; "the king will doubtless be here then, but I shall not." Sons, brethren, and fathers, one hundred years hence many monuments will adorn our halls and avenues. The effect will be fine. We shall not be here to see them, but the school, our sovereign, will be, and great will be the satisfaction.

By this course of remarks you have been reminded that this school was founded in favorable environs, at a propitious time, and also that it is only one of many kindred agencies initiated within the period under review. The Lawrence Scientific School of Harvard was almost coeval. In quick succession, colleges, departments of science, and independent institutes have appeared in every State. Of these, not a few have adopted the methods here followed, or have called to their support those who have here been trained. For one such institution, now celebrating its majority, permit me to acknowledge with filial gratitude the impulses, lessons, warnings, and encouragements derived

from the Sheffield School, and publicly admit that much of the health and strength of the Johns Hopkins University is due to early and repeated drafts upon the life-giving springs of New Haven.

This fellowship of scholars is one of the greatest satisfactions that the teachers, graduates, and students of a college can enjoy. Many of us are aware that we are but lay brethren, servitors or postulants, in the temple of science, disclaiming even the title of scientific men; but every one among us must be conscious that he has dwelt among the brethren, and that he can perform a part, though it be a very humble part, in upholding and applying the principles that this school inculcates and for which it stands.

We are enlisted, commissioned officers and privates, in an army which is not restricted to provincial recruits, and which carries light arms and heavy ordnance. Far and wide throughout the civilized world; in obscurity and poverty, or in stations of affluence and influence; alone or in companies; with complex engines and penetrating lenses, or with the unaided powers of masterly brains; now searching the depths of earth or ocean, now watching the stars in their courses, now bending over the microscope, the blowpipe, the alembic, the comparator, or the spectroscope, and now engaged in abstract reasonings, wondering that these mathematical relations have been so long concealed; often disappointed or led to merely negative results, and yet sometimes encouraged by an addition to science or by the perception of a

law hitherto unobserved—in all their diversity of powers and occupations, a noble corps is engaged in overcoming ignorance, that omnipresent foe, and the destructive cohorts that ignorance leads. Fear, superstition, bigotry, error, misery, weakness, pain, and sloth are put to flight by this array of wisdom against folly.

It gives courage to remember that the work of each generation is continuous with that of the past. The departed are with us. Thought as well as matter is indestructible. As the long list of philosophers, from Pythagoras and Aristotle to Isaac Newton, the great apostle of modern science,—*qui genus humanum ingenio superavit*,—prepared the way for the achievements of the nineteenth century, so men now living are heralds and pioneers of discoveries and conquests dimly foreseen or faintly foretold. Therefore it is not strange that, while the note of anxiety and despondency is heard in other spheres, no pessimistic cries proceed from our ranks. Slowly, steadily, surely, the stately column marches on, "never resting, never halting." Victory follows victory; light penetrates darkness; health, temperance, enjoyment, virtue, and piety follow knowledge.

Finally, let me say, with the solemnity of deep conviction, that dearer than the fellowship of brethren, deeper than the love of knowledge, too precious to be ever given up, too sacred for careless speech, is the invigorating and inspiring belief that science in its ultimate assertions echoes the voice of the living God.

of Yale University, New Haven

You have traced the evolution of an idea; you have seen how it has come to pass that in Yale, as in other universities, mathematical, physical, and natural science receives ample recognition. At first, in the Sheffield, chemistry was alone; engineering soon found a place; mathematics, physics, and astronomy joined the oligarchy; in due time, mineralogy, geology, physical geography, zoölogy, botany, and physiology found a welcome; modern languages and literature, history and economics, became strong allies. Not a word was spoken in disparagement of classical culture, nor a word of religious controversy.

You have heard the story of humble beginnings, gradual expansion, lofty ideals, personal sacrifices, munificent gifts, public services, abundant rewards; and also of well-founded hopes, looking forward to a second half-century of life and growth. Can I close with words more suitable than those of Laplace, as he reviewed his long life? "That which we know is but little; that which we know not is boundless."[1]

[1] Ce que nous connaissons est peu; ce que nous ignorons est immense."

THE UNIVERSITY OF CALIFORNIA IN ITS INFANCY

INAUGURATION OF THE PRESIDENT OF THE UNIVERSITY

OAKLAND, 1872

THE UNIVERSITY OF CALIFORNIA IN ITS INFANCY

GRATEFUL for the kindness with which I have been met, and full of hope for the future which opens before us, I enter upon this trust, imploring for the University of California the generous support of all good men within the commonwealth, and seeking the divine blessing upon our united efforts for the diffusion of knowledge, the promotion of science, and the furtherance of the welfare of our fellow-men.

It is an academic usage, in our land at least, that on occasions like this the incoming officer should express his views upon the higher education; and the usage cannot well be disregarded when one who is almost a stranger first enters a community of experienced teachers and aspiring scholars like that which is here assembled. My theme will therefore be the building of the university.

During the last few years great changes have been made in the higher educational systems of this and other lands. New institutions have been

built; old institutions have been rebuilt. Better halls, more varied programs, larger staffs of teachers, wiser methods of instruction, closer adaptation to the wants of society, are among the improvements rendered actual by advancing scholarship and increasing funds.

Everywhere among enlightened people, universities in their most comprehensive scope are in this year of grace receiving impulses which are as creditable to the spirit of the age as they are hopeful for the ages yet to come. Our State and national governments see that questions of the higher education must be met in the public councils, and in many places are vying with one another to devise wise schemes of educational development; the builder's hammer is heard in many seats of learning,—at Harvard, at Yale, at Amherst, at Princeton, at Ithaca, at Philadelphia,—constructing the walls which shall furnish homes to successive generations of pupils; collections of books, maps, and charts, and works of art, museums of geology and natural history and archæology, laboratories for chemical, physical, botanical, and zoölogical researches, are multiplying with a marvelous rapidity; lenses are made for the microscope and the telescope surpassing any which the physicist and astronomer have hitherto possessed; prizes and scholarships have been endowed, and fellowships sometimes providing for continued residence at the college, and sometimes for residence in foreign universities; to the traditional schools of law, medicine, and theology have been added schools of philology, of

The University of California in its Infancy

history, of the fine arts, of chemistry, engineering, agriculture, and mines—devices and arrangements to allure young men to higher attainments, and to aid them in their onward steps. Underlying all this, supporting all this, indispensable to all this, have been the prolific gifts of men of wealth, far-sighted and generous benefactors, whose names a grateful posterity will cherish forever as the true nobility of the republic, the lords and gentlemen of the American state. Such is the hopeful aspect of university education elsewhere.

Now comes the turn of this new "Empire State." California, queen of the Pacific, is to speak from her golden throne, and decree the future of her university. California, the land of wonders, riches, and delights; whose hills teem with ore; whose valleys are decked with purple and gold, the luscious vine and life-giving corn; whose climate revives the invalid and upholds the strong; whose harbor is the long-sought doorway to the Indies; whose central city is cosmopolite like Constantinople of old; whose pioneers were bold, strong, and generous; whose institutions were molded by far-sighted men, bringing hither the best ideas of many different societies, as the foundation of a modern Christian state; whose citizens are renowned for enterprise, patriotism, and vigor; whose future no seer can foretell—California, thus endowed by nature and thus organized by man, is to build a university. What shall it be? Time alone can tell, but forethought and faith may be factors in the problem.

Two things are settled by the charter of this institution, and are embodied in the very name it bears.

First, it is a "university," and not a high school, nor a college, nor an academy of sciences, nor an industrial school, which we are charged to build. Some of these features may, indeed, be included in or developed with the university; but the university means more than any or all of them. The University is the most comprehensive term which can be employed to indicate a foundation for the promotion and diffusion of knowledge—a group of agencies organized to advance the arts and sciences of every sort, and to train young men as scholars for all the intellectual callings of life. Universities differ widely in their internal structure. The older institutions are mostly complex, including a great variety of faculties, colleges, chairs, halls, scholarships, and collections, more or less closely bound together as one establishment, endowed with investments, privileges, and immunities, and regarded as indispensable both to the moral and material progress of the community, or, in other words, as essential both to church and state. In this country the name is often misapplied to a simple college, probably with that faith which is "the substance of things hoped for, the evidence of things not seen." We must beware lest we, too, have the name without the reality. Around the nucleus of the traditional college which has been well maintained since the earliest days of this State, we must build the schools of advanced and

liberal culture in all the great departments of learning just as fast as may be possible, and we must at least begin to recognize the various sciences by chairs which may each be the nucleus of a school or department.

Second, the charter and the name declare that this is the University of California. It is not the University of Berlin nor of New Haven which we are to copy; it is not the University of Oakland nor of San Francisco which we are to create; but it is the university of this State. It must be adapted to this people, to their public and private schools, to their peculiar geographical position, to the requirements of their new society and their undeveloped resources. It is not the foundation of an ecclesiastical body nor of private individuals. It is "of the people and for the people"—not in any low or unworthy sense, but in the highest and noblest relations to their intellectual and moral well-being.

Bearing, then, in mind that this is to be a university, and that it is to be the University of California, our next inquiry is this, What have we to build upon?

You may be supposed to know much better than I what reply to make to this inquiry; but some of the features which have arrested the eye of a newcomer may be of interest.

I observe that you have a good charter, not perfect,—and what instrument is perfect?—but carefully drawn, on the basis of good models, with strict reference to this community, and with a perception

of the needs of this age. It opens the door of superior education to all, without price. This charter is administered by an earnest board of regents, who mean that the university shall be a success, and who will not be disheartened by such perplexities and difficulties as beset all new and great undertakings. You have inherited from the College of California a good name, good books, good collections, and good will. Honor to those who founded it, and honor to those who enlarged it! Those pioneers who in the earliest days of this State established a college were worthy children of the pioneers of the Atlantic, who founded a college at Cambridge when the country was still a wilderness. Here the task was no less difficult than there. The lack of funds, the lack of an organized society, the pressure of material wants, —in short, the struggle for life,—was so great that the wonder is the college lived at all. It was the harbinger of good not yet fully realized or appreciated, perhaps not fully foreseen or designed; but be sure that a hundred years hence, when the centennial of the university is celebrated, as it surely will be, grateful homage will be rendered to the foresight, the vigilance, and the self-denial of those who founded and cherished the College of California.

> The hand that rounded Peter's dome,
> And groined the aisles of Christian Rome,
> Wrought in a sad sincerity;
> Himself from God he could not free.
> He builded better than he knew:
> The conscious stone to beauty grew.

You have inherited, also, a good site at Berkeley. When I first stood at Berkeley, and looked at the mountains and the bay, the town and the distant glimpses of the open sea, I recalled an hour under the elms at New Haven, more than two years ago, when I listened to the story of how this spot was chosen, of the rides and walks which were directed by an observing eye over the hills and into the valleys of this charming region, with a prophetic anticipation of the coming day when the college germ, already planted, would require a site worthy of its growth. The services of that enthusiastic scholar, whom California would gladly have kept, if Connecticut would have spared him, are honorably recorded in your early college annals, and are not forgotten by those who labored with him; but I cannot forbear to repeat at this time the name of one of those to whose encouragement my presence here is due—the name of Horace Bushnell of Hartford.

Among those things which are required to make a university, an ancient writer places, first, "a good and pleasant site, where there is a wholesome and temperate constitution of the air; composed with waters, springs or wells, woods and pleasant fields; which being obtained, those commodities are enough to invite students to stay and abide there." All this, and much more, is included in your site. You have a good system of popular instruction, of which the university is to be the crown; you dwell in a community largely composed of educated men, and are under a State government which, like a

parent, has made to the university a generous commencement gift.

Besides, we must not fail to note that a vast amount of scientific and literary work, of a very high order, has been performed in California—good not only in itself, but as the seed-corn of future harvests. The work of the United States Coast Survey on the Pacific, for example, in its careful study of the hydrography, its accurate delineations of the harbors, its investigation of the tides and currents, its solution of astronomical and geodetic problems, has gained renown for California science, not in our own country only, but in Europe, and has helped prepare the way for a complete triangulation of the national territory. Kindred services have been rendered by the engineers of the army. There is the Geological Survey of the State, which surpasses in thoroughness and completeness any like undertaking in the country, and is the delight and pride of all men of science who take an interest in the accurate and careful investigation of the natural characteristics of the land, either for its own sake, or regarded as a basis for social and political growth. Growing out of this work, though beyond the limits of the State and under the national authority, are the surveys of the fortieth parallel by a party of civilians attached to the corps of army engineers. Binding all the men of science together as a brotherhood of scholars is the Academy of Sciences, whose publications and collections are already of great

value. A young society which has done so well will be an important supporter of the young university.

Moreover, the literature of this coast possesses, like the fruits here growing, a richness and flavor of its own, so that some have even said that California alone of all parts of the land has made quite new and original contributions to American letters. The humor, the wit, and the poetry of the Sierras are as fresh as the breezes of the hilltops, and as spicy as the groves of pine. Oratory has here spoken with a patriotic voice, the echoes of which are still floating in the air. To foster your literature there is a journal whose fame has gone over land and over seas as well, the encourager, the suggester, and the producer of much that is choice and enduring. The day of the university has certainly dawned.

It is on the faculty more than on any other body that the building of a university depends. They give their lives to the work. It is not the site, nor the apparatus, nor the halls, nor the library, nor the board of regents, which draws the scholars; it is a body of living teachers, skilled in their specialties, eminent in their calling, loving to teach. Such a body of teachers will make a university anywhere. Agassiz, wherever he goes, is surrounded by a company of disciples; Whitney would have his class in language at Berlin or Benares. Such men will draw not pupils only, but the books and the collections they require, as nat-

urally as of old Orpheus drew the rocks and beasts. The *genius loci*, the spirit of the place, will be the spirit of the faculty. If truth and culture are their aim, truth and culture will flourish in the college where they toil. If sordid motives or unworthy jealousies spring up among them, the trust they bear will be in peril. A university requires more than anything else a large and vigorous staff, so that the various sciences and languages may have their devotees, young men of different tastes and characters may find fit guides, and the idiosyncrasies of one school or chair may be modified and counterbalanced by the qualities of another. It is now difficult, both in Europe and this country, to secure enough teachers of eminence, for other callings are better paid and are held in equal honor; let, then, no opportunity be lost to enlist strong men of attainment or of promise.

The regents or trustees of a college have the great responsibility of appointing the body of teachers and of providing the funds. They are the power behind the throne, unseen in the daily work of the college, but never for a moment unfelt. Upon their wise choice of instructors, their careful guardianship of moneys, their construction of buildings, their development of new departments and schools, their mode of presenting the university to the public, will depend the confidence and liberality of the community. On them the shafts of criticism may be often inconsiderately hurled, but in the long run they will add the gratitude of the State to

their own consciousness of fidelity and self-sacrifice in behalf of learning and the country.

The State authorities, executive and legislative, have also a great part to perform in the support of this university, not by overmuch legislation, nor by hasty action in respect to its development, but by steady, munificent, and confiding support. Quick to help and slow to interfere should be their watchword.

None of the higher educational establishments in this country has flourished without the support of the ministers of religion. Their counsels and those of the other educated professions are continually sought by parents and young men; they are interested in all that promotes intelligence and truth; they have been from the earliest colonial days the founders, guardians, and teachers of our best institutions. I trust this university will always merit their support, for if worthy it will surely win it.

The press is another social power on whose help we must count. It can quicken or retard the establishment of a complete university by its favoring or censorious attitude. Its criticism the university should not fear; its cordial support the university should desire. Powerful everywhere, the press in a free country is a force which all must appreciate; let us hope that its assistance will here be generously accorded in the advocacy of the higher education, and in guiding the opinions of those who read.

On the men of wealth in this community I greatly

rely. It is true the State has been, and is likely to be, liberal in its appropriations; but a great university requires almost unlimited means for its support. The library alone could well employ in the purchase of books and the payment of salaries the income of half a million dollars. A school of science would not be liberally endowed with a capital of that amount. Funds to the extent of several thousand dollars might be annually employed in scholarships and prizes. Homes or halls will soon be needed in some form for the occupation of the students when the university goes to Berkeley. Professorships representing studies which are not taught to undergraduate students, but which should be cherished in the university, must also be founded. I trust the day will come when the spire which silently points heavenward will mark our place of worship. But for all these things we cannot expect the public treasury to be opened. Relying upon that for the most essential things, we must look to men of wealth to provide the richer and more complete endowments which will place our university by the side of her older sisters at the East. The rich Californians who have made this wilderness rejoice and blossom like a rose, who have built these banks and warehouses, these railroads and steamships,—the men who by their enterprise have made a university desirable and possible, and who now need it for their children,—must make it actual by their munificence. In the race for the encouragement of knowledge and the education of the young, the Occident must not be distanced.

I need not say much of the spirit with which we are to build. It is enough to remind you that the individual must be quite subordinate to his work —each member of the faculty and of the regency to the university of which he is a member; that the present and the future are both to be cared for; that a catholic liberality should be cherished toward every branch of useful knowledge; and that a high ideal should be constantly in mind. The teachers should show themselves friends to the scholars; the latter should trust their instructors; the right hand of good will should always be held out toward the public; and the effort should be made to "bridge over the gulf between theory and practice," or, in other words, to promote at the same time abstract science and useful knowledge.

There are peculiarities in the structure which we propose to build, arising partly from the newness of this State, and partly from its geographical position; largely also from the wants which are felt in the development of its mines, manufactures, agriculture, and commerce. In one view, we may say that the new education should here have full scope; in another, we may say that there is no distinction between new and old education—there is only the wise adaptation in each generation of the experience of the past to the wants of the present.

In years long since gone by, the schools of the cloister taught divinity chiefly, with the scholastic subtleties of metaphysical discussion; when literature came in to the universities, after the so-called "revival of letters," in the form of studies in

Greek, the scope of education was extended to the humanities, but the advocates of divinity studies were hostile to the change; when research went out into all departments of nature, the lovers of the humanities were ready in their turn to close the door on science, even as the door had before been closed on the study of Greek. Such barriers are no longer defensible. Science and the humanities, nature and man, are now alike recognized as the best interpreters of divinity. Each of these topics deserves, therefore, a few words.

This recognition of divinity, humanities, and science—God, man, and nature—gives great comprehensiveness to a modern university; indeed, there is nothing left which could be included. But practical difficulties are not avoided by such general statements. Regarding each individual scholar, regarding each program of studies, the perplexity arises, not what branches may be, but what branches must be, included in a certain course. The perplexity will never be avoided, but the practical question will always be put in some such forms as these: What is the relative importance of different branches, and what studies most deserve encouragement? Shall literature and language, the traditional classical course of our colleges, be made first in rank? or shall the place it has held be given up to science in its theoretical and practical aspects? Are the modern languages to be chosen rather than the ancient? Shall history and political science, with the study of the Roman law and the theory of the state, be preferred? or shall mathematics be the

dominant theme? Is the acquisition of knowledge, or the acquisition of discipline, as it is called, the end of instruction? Shall general studies which may be presumed to have an equal value in all the varied callings of life, or special studies which have decided reference to a professional or technical career, be commended to the youthful student? Shall lectures, or shall recitations, or shall literary and scientific research, be the method of education? Shall universal freedom of choice and of work be permitted, or shall collegiate restrictions and control be insisted on? These and a score of kindred questions are now under discussion in the various colleges of this country, and will long require our most serious attention.

A part of the difficulty disappears when we distinguish the requirements of young scholars, like those who have just left the high school and the academy, from those of advanced students, whose tastes, talents, and wants are specialized. Give the former prescription; give the latter freedom; but let the prescription vary with the varying peculiarities of individuals, and let the freedom allowed be the freedom which is governed and protected by law. College work for college boys implies daily guidance under prescribed rules; professional work implies voluntary, self-impelled enthusiasm in the acquisition of knowledge.

Another difficulty arises from the vast expansion of science—so vast that it is impossible for any one, were he gifted as Leibnitz or long-lived as Humboldt, to master the details of modern researches.

The average scholar, having neither the genius of the one nor the life-assurance of the other, must be content to fill a much more restricted field. The versatile and facile American must learn to admit that there is a difference between ability to do anything and ability to do everything.

I take it for granted that in the State of California there is no occasion to make a plea for the study of modern sciences. The need of civil, mining, and mechanical engineers, of expert geologists and mineralogists, of devoted naturalists and physicists, of chemists and metallurgists, of geodesists, topographers, and map-makers, of agriculturists, mechanics, manufacturers, and merchants, well trained for their various callings, is now so obvious that I need not advocate the importance of science in education. Its place is acknowledged. The question is, how to secure the best sort of instruction, the fittest sequence and relation of studies, the most eminent teachers, the most complete laboratories, and the best apparatus; and likewise how to encourage that special proficiency which is indispensable to success in modern scientific professions, with that literary culture which makes a scholar and befits a gentleman. Health, wealth, popular intelligence, and the spread of Christian civilization are so dependent upon the discoveries of science, and the applications of these discoveries to a thousand useful arts, that a young and still undeveloped State may well afford to be liberal in the encouragement of this class of studies.

Science, though yet you have built no shrine for

her worship, was the mother of California. It was her researches, her summings up of the experience of the world, her studies of nature, which have made possible and fruitful the work of practical men. Science stands ready to do far more for the community than ever yet, if only you will encourage her wholesome efficiency. Science is but accurate knowledge, systematically arranged and philosophically discussed. She surveys your harbors, marks the path of the mountain railroad, discovers the relations of the strata of the rocks, teaches the laws of climate, maps out the Sierras, reclaims the waste lands, suggests improvements in agriculture, annihilates with the telegraph the vast area of space which separates you from London and New York. She interprets nature, and gathers up all which the "practical" workers have found out. Unfolding the plan of an immutable Creator, she will yet be recognized as the handmaid of religion.

At an early day I hope to have an opportunity of discussing more fully the recent progress of scientific and technical instruction with reference to the wants of this State. We shall find it worth while to note the experience of the Lawrence and Sheffield scientific schools, of the Rensselaer Institute and the Massachusetts Institute of Technology, of West Point and Annapolis, and of the various colleges of agriculture and the mechanic arts which the congressional grant has created. We may learn in some respects even more from the experience of France, Switzerland, and Germany.

With all this experience before us, intelligent men will be likely to admit that among the first wants of California are distinct, complete, and well-organized schools of science and technology, such as your organic laws contemplate, in which men of eminence shall have the means and the leisure to make researches in all the departments of investigation; to whom young men shall resort for training in those studies which are closely related to the development of mines, agriculture, manufactures, and means of transportation; and from whom the public at large, by the press, by the lecture, by the informal consultation, may be instructed in the characteristics of this remarkable country, and the mode in which its resources can be made most serviceable to mankind. My chief anxiety is whether the people of this coast are yet ready to pay for the luxury and the advantage of such serviceable institutions. It will require a great many teachers, costly laboratories, large funds—more, I fear, than the university, with all the claims upon its treasury, is yet able to command. Perhaps some individual whose experience has taught him the value of such knowledge, and who has an honorable ambition to leave a name among the benefactors of the State, will for this special purpose supplement the resources of the University with a generous private gift, like those which have done so much for the culture of Eastern youth and the improvement of the Atlantic States. He will be sure of a monument more enduring than gold.

But while nature and its laws in all their various

aspects and applications are thus engrossing, man and all his experiences and achievements are likewise of transcendent importance. Above all matter is man; above both matter and man is a divine power, so that the individual or the institution that regards only the natural forces of this globe, without observing likewise the intellectual and spiritual forces, sees only half the world.

Give us more and not less science; encourage the most thorough and prolonged search for the truth which is to be found in the rocks, the sea, the soil, the air, the sun, and the stars, in light and heat and magnetic forces, in plants and animals, and in the human frame; but let us also learn the lessons which are embodied in language and literature, in laws and institutions, in doctrines and opinions, in historical progress and international relations. Let language, history, and literature, oratory, poetry, and art, still form a chief part of liberal culture, while mathematical, physical, and natural sciences are admitted to the rank from which they have long been excluded.

In California, it seems to me, there are special reasons for such a plea. This is still a young State; it is the most advanced and prosperous of a group of young States, the power of which in this Union no one can exaggerate. The young men who are to go out from this university are to be the lawmakers, the guides of public education, the men of influence and capital, the administrative authorities, the journalists, the orators, the formers of public opinion, not only in California,

but over this vast new area of the continent, where the State is still in infancy. Such young men, even more than the educated in older republics, should be, no matter what their daily occupations are, well grounded in the principles of governmental and social science. They should also be familiar with the usages of the most civilized and enlightened communities, and with the opinions of the most trustworthy statesmen, jurists, and philosophers. It is important, for their own culture and for the public good, that they should have a clear notion of what constitutes the State in its best form. Whether merchants, manufacturers, farmers, or miners, they are quite as likely as lawyers, and much more likely than physicians and clergymen, to be called to the councils of legislation, and to pronounce opinions there on difficult questions pertaining to human society, law, finance, property, education, crime, pauperism, and the policy of the national, State, and local governments.

California is not only the center of a group of young States; it is the State through which distant nations are becoming acquainted with American institutions. Its influence in the organization and regeneration of lands beyond the sea is unquestionably but just begun.

Therefore I say that the study of history,—not as dry annals, but as the record of living forces and human experience,—the study of political economy, of social science, of civil liberty, and of public law, should be made attractive by the voices of

original and profound teachers, who can gather up the wisdom of the old and apply it to the requirements of the new generations.

In the study of humanity and history, language is the master-key which unlocks all doors. Time is wasted in questioning whether ancient or modern languages are most important. In the university both groups must be taught; the more any individual has, the richer will be his life. Certainly the study of English, which every one of us employs as the instrument by which we think and by which we communicate our thoughts to others, should be carefully promoted. In these days, when so much that is new and important first appears in German and French, no system of education can be called liberal, as it has well been said, which does not include those tongues. Greek and Latin are not only of value for the literature and history they embody, but for their important relations to more modern tongues. On this coast there are special linguistic requirements. Spanish certainly should be taught in the university. It is a praiseworthy forethought on the part of one of the regents[1] which has led him to provide among us for the study of Chinese and Japanese. His presence here cannot restrain me from now rendering a public tribute of gratitude for this wise and timely munificence. Let us hope that his generous purposes will, ere long, be realized. To complete the instructions in Oriental tongues at least two other chairs will be needed: one to be for Hebrew and

[1] Hon. Edward Tompkins.

the Semitic languages, which, perhaps, some other citizen will be glad to establish; and one for Sanskrit and the comparative philology of Indo-European tongues—the group to which the chief languages of Europe belong. The world of letters would also rejoice if, ere the last of the Indian races disappears before the progress of civilization, encouragement could here be given to some scholar to gather up and perpetuate the knowledge of their speech. In all our linguistic study we need to get beyond and above mere grammatical drill, and to think of speech as one of the chief endowments of human nature, and "of every language as a concrete result of the working out of that capacity, an institution of gradual historic growth, a part of the culture of the race to which it belongs, and handed down by tradition from teacher to learner, like every other part of culture; and hence that the study of language is an historical science, to be pursued by historical methods."[1]

In the teaching of both history and language, as well as of science, the university may well be guided by the "comparative method," which has yielded already such good results. It is thus characterized by an able historian: "The comparative method in philology and mythology—let me add, in politics and history, and the whole range of human thought—marks a stage in the progress of the human mind at least as great and memorable as the revival of Greek and Latin learning. It has put the language and the history of the so-called

[1] Professor W. D. Whitney.

'classical' world into their true position in the general history of the world. By making them no longer the objects of an exclusive idolatry, it has made them the objects of a worthier, because a more reasonable, worship. It has broken down the middle wall of partition between kindred races and kindred studies; it has swept away barriers which fenced off certain times and languages as 'dead' and 'ancient'; it has taught us that there is no such thing as 'dead' and 'living' languages, or 'ancient' and 'modern' history; it has taught us that the study of language is one study, that the study of history is one study. As man is the same in all ages, the history of man is one in all ages."[1]

The recognition which should be given to religion in a State university involves considerations which are not to be encountered in colleges founded by church authorities or by private corporations. The old English colleges, whose traditions New England has gratefully accepted, were the children of the church, and though their doors are no longer shut to nonconformists, their ecclesiastical character is still decided. Harvard College, the mother of all our higher institutions, still bears upon its escutcheon, *Christo et ecclesiæ*, the motto of its founders. Yale College went back to the Old Testament for a symbolic watchword, and bears upon its seal the open oracles inscribed with Hebrew characters. At Nassau Hall we are told that "in regard to religious truth there will be no uncertain

[1] E. A. Freeman, in his recent Rede Lecture at Cambridge, England.

sound." At Cornell University a generous gift has been accepted for a chapel, with a foundation, if I am rightly informed, which will secure the services of eminent preachers, and with a plan for daily religious worship. But none of these institutions is a State university, though all of them were fostered in their infancy by the kindly nourishment of the public treasury. We are, on the contrary, the guardians and friends of a State university, established in the midst of a community more varied than almost any other in the land. Here are still the traces of the Spanish pioneers who brought to these shores so long ago, with the symbol of the cross, the emblematic keys of the Roman pontiff; nearly all the various forms of Christian faith which the episcopal and non-episcopal churches of the Reformation have professed find here their advocates; there are many among us, likewise, who look for a Messiah yet to come; and crowding into these harbors behold the children of Confucius and the worshipers of the unknown gods.

The state, as a body politic, protects the assemblies and the worship of all these bodies; it favors none. How shall it be with the university and the public school, which perform the service of the state in the education of the young? Shall religious teaching be excluded from the university, or shall it have a covert and an apologetic place? Shall it be an organized force, or a silent and all-pervading influence? Shall its spirit be narrow and sectarian, or shall it be catholic and free? The diffi-

culty is not felt in California alone. It is involved in the toleration of the modern Christian state toward all forms of religious belief, and in its generous provisions for the promotion of education.

In meeting the difficulty, it may be well to bear in mind that religion includes four different elements—worship, doctrines, precepts, and spirit. A religious spirit no one objects to; it is the spirit which looks "upward and not downward, forward and not backward, outward and not inward, and which lends a hand"; it is the spirit which does justly, loves mercy, and walks humbly with the Lord; it is the spirit of truth, of faith, of hope, and of charity; it is the spirit of "peace on earth, good will to men." We may say, as we say of science, the more we have of the genuine the better for mankind. Whatever precepts will tend to cherish this inward spirit and the outward uprightness and unselfishness which proceed from it, all good men will indorse. When we begin to formulate doctrines into creeds and symbols, then come controversy and difference,—the right wing against the left wing, the conservative against the liberal,—so that an attempt to enforce the doctrines of this or that ecclesiastical body will be sure to come to grief. The university is no place for sectarian controversy or denominational zeal. It is a school of learning. But as a school of learning it must teach the history of opinion and belief; it must teach the rise and growth and decay of institutions; it must show how Christian civilization has overcome pagan practices and beliefs, and has

purified the home, the state, and the relations of nations, modifying laws, usages, manners, and languages, establishing charities, reforming prisons, securing honesty, virtue, and justice. All this should be taught by scholars, and not by partizans. If the body of teachers and students, imbued by this spirit of truth and charity, will daily assemble of their own accord to acknowledge their dependence upon divine wisdom, to chant the psalms of David, and to join in the prayer which the Master taught his disciples, who can doubt that such communion of worship will elevate the character of all who engage in it, and of the institution to which they belong? So far as this I would have our university go, forcing none to attend upon such religious worship, drawing all to it by their own consciousness of its value.

But many would go further than this. Many parents, many religious teachers, many churches, desire and insist that youth at the critical period of college life shall be surrounded by positive, outspoken, and persuasive religious influences. They are afraid of a State university, and long for an ecclesiastical college. Hence come the many attempts to promote the higher education, when one united effort would hardly be adequate. But it seems to me that the end in view might be secured by better methods. Why may not any religious body or association, or private individual, desirous of protecting the young men from temptation and encouraging them in the higher life, establish, in

connection with the university, a home, or hall, or college, which should be controlled according to the founder's views, should be a privileged residence, should be endowed perhaps with prizes and purses? I can imagine, on the slopes at Berkeley, a group of students' houses, bearing honorable names, and made attractive by the convenience of their arrangements, the good-fellowship within their walls, the privileges of the foundation. I should hope they would not be barracks or dormitories, but homes, with rooms of common assembly and private study. I should hope the bath-room and the dining-hall would be included in the structure; and if any would go so far as to have a place of light amusement and recreation, I, for one, should not object. Within such college halls the love of learning would reign, bad morals and ill manners would be excluded, and priceless associations would be cherished, like those of Harvard and Yale, Cambridge and Oxford. Here, under right guidance, the best moral and religious influences might be promoted. What church, what association, or what generous individual will be the first to establish such a hall?

In these convictions, which are the result of anxious thought and familiar conference with many of the most liberal and the most conservative leaders of education and opinion, I am strengthened by the utterances of the president of Princeton College, the Rev. Dr. McCosh, who has studied, in Great Britain and Ireland, a kindred

difficulty. He suggests in his inaugural the question, "How is religion to be grafted on state colleges, open to all, whatever their religious profession?" and he answers it by the clear declaration, confirmed by examples: "Let the state provide the secular instruction, and the churches provide the religious training in the homes in which the students reside."

I hail it as an omen of good, for both religion and learning, that the site of this university bears the name of Berkeley, the scholar and the divine. It is not yet a century and a half since that romantic voyage which brought to Newport, in Rhode Island, an English dean who would found a college in the Bermudas—the Sandwich Islands of the Atlantic—for the good of the American aborigines. He failed in seeing his enthusiastic purpose accomplished. He could not do as he would; he therefore did as he could. He gave the Puritan college in New Haven a library and his farm, and endowed in it prizes and scholarships which still incite to the learning of Latin. There his memory is ever kept green. His name is given to a school of divinity in the neighboring city of Middletown. It is honored in Dublin and Oxford, and in Edinburgh, where his memoirs have just been written. His fame has crossed the continent, which then seemed hardly more than a seaboard of the Atlantic; and now, at the very ends of the earth, near the Golden Gate, the name of Berkeley is to be a household word. Let us emulate his example. In the catholic love of learning, if we cannot do

what we would, let us do what we can. Let us labor and pray that his well-known vision may be true:

> Westward the course of empire takes its way;
> The four first acts already past,
> A fifth shall close the drama with the day;
> Time's noblest offspring is the last.

Busy though we be as the builders of this university, the hours of rest will follow on the hours of toil; doubtless, also, disappointment and embarrassment, those unwelcome thieves, will haunt us with their presence. In these hours of repose and doubt, we shall often ask ourselves, What is all this building for? why do we spend our money for that which is not bread, our labor for that which satisfieth not? why all this eagerness for books and teachers, for halls and funds? why all these anxious thoughts about education and culture and university progress? You, sir, my honored predecessor, about to throw off the academic gown; you, my colleagues in the faculty; you, gentlemen of the board of regents, already know that ours is no easy undertaking. With what philosophy can we fit ourselves for a long and weary task? Not we alone are to ask this question. The State before renewing its endowments, the national government before repeating its grant, the men of wealth before founding new professorships, and the fathers before sending us their boys, will often ask, "What for?" Let us have our answer ready. Let us trace the influences which have proceeded from

Athens, where Socrates and Plato taught—teachers whose words still nurture our statesmen and theologians; from Bologna and Paris, where students dwelt by thousands; from Oxford and Cambridge, where so many of the foremost leaders of Anglican literature, politics, and science were fitted for their career; from the seats of learning in Germany, now surpassing in number of teachers and students the universities of every other state; from the colleges of New England and the Atlantic seaboard. Let us study such examples, and say with courage and hope that the University of California shall be a place where all the experience of past generations, so far as it is of record, and all that is known of the laws of nature, shall be at command for the benefit of this generation and those who come after us; that here shall be heard the voice of the wisest thinkers, and here shall be seen the examples of the most diligent students in every department of science. Let us say that here high-minded youth, while they train their powers as in a gymnasium, may also fit themselves with armor for the battle of life, and may study examples of noble activity. Let us see to it that here are brought together the books of every nation, and those who can read them; the collections from all the kingdoms of nature, and those who can interpret them; the instruments of research and analysis, and those who can employ them; and let us be sure that the larger the capital we thus invest, the greater will be the dividend.

What is the university for? It is to fit young

men for high and noble careers, satisfactory to themselves, and useful to mankind; it is to bring before the society of to-day the failures and the successes of societies in the past; it is to discover and make known how the forces of nature may be subservient to mankind; it is to hand down to the generations which come after us the torch of experience by which we have been enlightened.

It is wisdom that the university promotes; wisdom for individuals and nations, for this life and the future; a power to distinguish the useless, the false, and the fragile, from the good, the true, and the lasting. There was a wise man of olden time who figured its value as well as any of the writers of to-day, when he said: "Happy is the man that findeth wisdom, and the man that getteth understanding: for the merchandise of it is better than the merchandise of silver, and the gain thereof than fine gold"; and his estimate of postgraduate instruction deserves our assent: "Give instruction to a wise man, and he will be yet wiser: teach a just man, and he will increase in learning."

A single word in conclusion. The possible relations of this university to the new civilization of the Pacific coast and to the enlightenment of Asiatic nations give a special interest to its work; for it is obvious that California is not only granary, treasury, and mart for the American States which are growing up on this long coast, but it is the portal through which the occident and the orient must exchange their products and their thoughts. China and Japan, Australia and the islands of the

sea, are the neighbors and the customers of the Golden State. Shall they not also look here for instruction in the arts and sciences, and for an example of a well-organized and well-educated community? The endowment of a professorship which shall be devoted to the study of Chinese and Japanese indicates an early recognition of this intimate relationship. We cannot be too quick to prepare for the possible future which may open upon us. It is not yet determined in what way the Chinese and Japanese indemnity funds shall be employed, but public discussion tends to their devotion to the promotion of education, either in this country or in the Orient, for the benefit of those from whom the funds were received. Would it not be fit that in this vicinity, near to, if not in connection with, this university, a special school should be founded with these funds, having the double purpose of enlightening Americans in respect to the languages, literature, and history of the East, and of instructing the Chinese and Japanese in the modern languages and sciences of Europe and America?

A new epoch of history seems opening before us. The early nations, with what has been called their fresh-water civilization, flourished on the Nile and by the rivers of Babylon. At a later day the Mediterranean became the center of successive empires —monarchs of a landlocked sea. Modern civilization has bordered the Atlantic. Now, face to face, with the great Pacific Ocean intervening, are the oldest and the youngest forms of human society. Steam already shortens the space, and the tele-

graph will soon annihilate the time which separates eastern Asia and western America.

Toward the good which may follow in commercial intercourse, in mutual good-fellowship, and in the promotion of a higher civilization, the University of California must stand ready to do its part.

As I look forward to what is opening beyond the mists which rest upon the harbor, I feel like quoting, with a single syllable of adaptation, the prophetic dream of a gifted English scholar in regard to his western outlook.[1]

> I am turning my eyes toward a hundred years to come, and I dimly see the land I am gazing on become the road of passage and union between two hemispheres, and the center of the world. I see its inhabitants rival Belgium in populousness, France in vigor, and Spain in enthusiasm.
>
> The capital of that prosperous and hopeful land is situate in a beautiful bay and near a romantic region; and in it I see a flourishing university, which for a while had to struggle with fortune, but which, when its first founders and servants were dead and gone, had successes far exceeding their anxieties. Thither, as to a sacred soil, the home of their fathers, and the fountainhead of their Christianity, students are flocking from east, west, and south, from America and Australia and India, from Egypt and Asia Minor, with the ease and rapidity of a locomotion not yet discovered, and last, though not least, from England—all speaking one tongue, all owning one faith, all eager for one true wisdom; and thence, when their stay is over, going back again to carry over all the earth "peace to men of good will."

[1] John Henry Newman, in reference to the Catholic university in Dublin.

KNOWLEDGE AND CHARITY

AN ADDRESS ON THE RELATIONS OF A HOSPITAL TO MEDICAL SCIENCE, DELIVERED AT THE OPENING OF THE JOHNS HOPKINS HOSPITAL

BALTIMORE, MAY 7, 1889

The founder of the Johns Hopkins University established also a hospital, and expressed the wish that, when completed, it should form a part of the medical school of the University. At the opening of the Hospital, the following address was given by the President of the University, then acting as Director of the Hospital. Addresses by the President of the Hospital Trustees, Mr. Francis T. King, and Dr. John S. Billings, the expert adviser of the Trustees in the construction of the Hospital, have been printed elsewhere.

KNOWLEDGE AND CHARITY

THIRTEEN years ago, during the centennial celebrations of Independence day, the university founded by Johns Hopkins began its work, and now, as we commemorate a completed century of constitutional life, the hospital, gift of the same donor, throws open its doors. These buildings, on which thought, time, and wealth have been freely spent, are now consecrated to the ministry of mercy and the prolongation of life. Science and charity, knowledge and pity, skill and sympathy, are here installed in the service of mankind.

That large-minded citizen of Maryland, "who, by noble gifts for the advancement of learning and the relief of suffering, has won the gratitude of his city and his country," found two words adequate to his great ideas. "University" and "hospital" were his chosen terms, and he linked them together by this significant phrase: "Bear constantly in mind that it is my wish and purpose that the hospital shall ultimately form a part of the medical school of that university for which I have made ample

provision by my will." How brief the phrase, how large the purpose! "Apples of gold in pictures of silver."

Like James Henry Roosevelt of New York, "a man upright in his aims, simple in his life, and sublime in his benefaction,"[1] whose hospital and dispensary give clinical instruction to the College of Physicians and Surgeons; like James Lenox of New York, whose, munificence established a public library and provided for a hospital, Johns Hopkins, already honored as a patron of learning, will be henceforward remembered in the annals of charity and medicine. May we not almost say of him as Pindar said of Theron:

> And I will swear
> That city none—though she unroll,
> A century past, her radiant scroll—
> Hath brought a mortal man to light
> Whose hand with larger bounty flows:
> The blessings to that man we owe,
> Say, who shall hope to count?[2]

We may form an idea of what this hospital may become by the study of a like institution in London. About a century and a half before Johns Hopkins died, the days of Thomas Guy were ended. Like our benefactor, he had lived unmarried to the age of eighty years, and from humble beginnings had acquired a fortune, with which he provided for

[1] This phrase (like that above, referring to Johns Hopkins) is taken from a memorial tablet.

[2] Olympic II, Cary's version.

the establishment of a hospital. The amount of his gift was more than a million dollars (£238,-292). The beneficent influences of Guy's Hospital are now known in every part of the globe. It is doubtless safe to say that every one of us has shared indirectly in its benefits. The name of the great surgeon, Sir Astley Cooper, would alone give renown to the hospital to which he was attached —Sir Astley Cooper, of whom it was said that, from the period of his appointment to Guy's until the moment of his latest breath, he was everything and all to the suffering and afflicted; his name was a host, but his presence brought confidence and comfort.[1] Addison and Hodgkins, whose names are familiar to the historians of medicine, were physicians in that hospital. So was Richard Bright, whose discoveries have been pronounced the most important contribution to medical science made in the first half of the nineteenth century. The observations and studies made in Guy's Hospital since 1836 fill fifty volumes. Thousands of medical students have been trained within its walls; "their presence," says a competent observer, "has made the hospital." Hundreds of thousands of patients have received relief from the treatment there afforded. In a single year five thousand indoor patients have been cared for and more than thirty thousand outdoor patients have sought advice.

But we are planning for a future much longer than a century and a half; for a history as long as

[1] Letter of Dr. Roots in the "Memoir of Sir A. Cooper."

that of St. Bartholomew's or St. Thomas's, which now, after many centuries, are more useful than ever.

I hold in my hand a volume just received from Dr. Norman Moore, the warden of St. Bartholomew's Hospital in London, bearing an inscription so welcome and so apposite that I will read it: "To the library of the newest of hospitals this account of the progress of medicine in one of the most ancient is given by Norman Moore, with the earnest hope that the Johns Hopkins Hospital may flourish at least as long as the Royal Hospital of St. Bartholomew, in Smithfield, and prove no less useful to mankind. On the opening day of the Johns Hopkins Hospital, 1889."

This little book is full of suggestions for us. First, as to the longevity of a hospital. "For more than seven hundred and fifty years the hospital has flourished upon its present site, and its Smithfield gateway, through which passed men of the generation whose fathers saw William the Conqueror enter London, has ever since been open to the sick poor."

Then as to the progress of medical science. Here you may see "how the physician grew from a schoolman into a scientific observer, and how the surgeon, who appeared on the scene in livery and without learning, grew from a handicraftsman to be a man of science."

Next as to the training of illustrious men. Here you will find a record of the names and services of Caius, Bernard, Pott, Abernethy, Lawrence, and

Paget; you may learn that Dr. Thomas Young, the originator of the undulatory theory of light, was here a student; and you will come upon the story of one more famous than any person I have named, the discoverer of the circulation of the blood, Dr. William Harvey.[1]

Time may efface the personality of our founder, as it has effaced the personality of Rahere, the founder of St. Bartholomew's, but the beneficence of Johns Hopkins will last for centuries; and gratitude will cherish the memory of his broad views, his great liberality, his wise and beneficent purposes.

In proceeding to consider the benefits likely to proceed from this hospital, I have been reminded that in 1789 John Howard, a pioneer among modern philanthropists, published in a quarto volume, just before his death, the observations he had made upon the lazarettos of Europe. That was the beginning of reforms in prisons, asylums, refuges, and hospitals. To this work he prefixed these words of Cicero, a motto so appropriate that I might take it for a text: "Quid tam porro regium, tam liberale, tam munificum, quam opem ferre supplicibus, excitare adflictos, dare salutem, liberare periculis."[2]

First, last, and always, this hospital is to furnish relief to the sick and wounded. Make the best of

[1] Dr. Moore calls attention to the fact that it was a fund given by Dr. Caius to encourage the study of anatomy which was the immediate means of leading Harvey to his discovery, and also to a remark in one of Harvey's lectures that it was a passage of Aristotle which first suggested to him the idea.

[2] Cicero, "De Oratore." i, 8.

it, introduce fresh air and sunshine, provide the utmost comfort, secure wise physicians, engage the best trained nurses, decorate the walls with pictures, bring fruit and flowers and books and friends, and even the comforting influences of religion, yet you cannot conceal the direful consciousness that this is the home of suffering.

> From any other ill
> (Except it be remorse) can men escape
> By work—the healing of divinest balm
> To whomso hath the courage to begin;
> But sickness holds the sick man in a chain
> No will can break or bend to earthly use.[1]

The names that have been given to these abodes of the sick are suggestive. "Hospitality" and "hospital" alike suggest the bestowal of kindness to guests. The word "lazaretto," ultimately degraded, pointed at first to the restoration of life. *Misericordia, la Charité, la Pitié*, the "home of the good Samaritan," the "house of mercy," bring to mind the kindly influences of love and care. St. John, St. Thomas, St. Bartholomew, and St. Luke above all other apostles, are favorite patronymics. Paracelsus died in the Hospital of St. Sebastian. Bethlehem, Bethany, Bethesda, and Jerusalem recall the scenes where the great Physician was present. The name of Christ has been given to many a foundation. In other places the hospital bears the loftiest title—*hôtel-Dieu*, or "house of God."

By whatever name it may be called, this is a con-

[1] Ugo Bassi's "Sermon in the Hospital," p. 13.

vent where sickness bears sway. The rule of sympathy with the suffering must govern everybody with a strictness of discipline as rigid as the rule of the Benedictines or the Carthusians. Those who daily walk these cloisters will be the warders of life and health, however high their station or however humble their service; and casual visitors will not cross the threshold of the wards without pity for those who are disabled, or without admiration and gratitude for those whose lives are spent in alleviating distress.

This hospital will not only meet the daily calls of humanity; it will stand ready to render extraordinary services in those emergencies which not even the progress of municipal reform and preventive medicine can entirely ward off. A fire, an explosion, an accident on the rails or on the sea-shore, the fall of a platform or of a building poorly constructed, may at any moment tax the utmost resources of a great establishment. True, we have no fear of leprosy and the plague; we have almost ceased to dread the coming of the cholera; yellow fever we are learning to thwart in its approaches to our Northern seaports; vaccination, which was spoken of by Sir James Simpson as "the greatest thought ever broached in practical medicine," is a great prophylactic; but we are not certain that diphtheria and infectious fevers will not continue to be epidemic; nor can we always be sure that the boards of health in the city and State will succeed in protecting us as well as they can from the inroads of pestilence. Indeed, it is well to inquire

whether Baltimore is now fortified as it should be against the hostile incursions of epidemic disease. In addition to its other functions, this hospital will stand as a reserve force, a storehouse of energy, ready to serve the city if apprehension and disease spread their pall upon it.

Here let me say, in anticipation of the future and in memory of the past, that the records of bravery on land and sea find their noble counterparts in those of the medical profession. Free from excitement, free from the hope of reward, free from any commands but those which are divine, they have in times of pestilence gone from bed to bed, firm, fearless, faithful, carrying the offerings of cheer, comfort, and relief, and often of restoration to health and vigor. For them there is no repose in time of danger. The black wings of death hovering over a city do not deter them from duty; and often it may be said of them, as Milton said of Abdiel, faithful found among the faithless, faithful only they. Read the annals of modern pestilence, of cholera in New York, of fever and famine in Ireland, of yellow fever in the South. Everywhere it is the same story. The more direful the record, the more unflinching, the more self-forgetful, the more humane are the efforts of physicians.

While the offices of a hospital are bestowed without money and without price on those who are destitute, those who are able to pay for suitable attendance, and for the domestic comforts to which they are accustomed, will discover that they can here be better treated than in many private houses.

The conditions of quiet are more easily secured; suitable diet at unusual hours can be commanded; medical attendance is within call at every moment of the day and night; manifold appliances for relief are more readily obtained. More and more frequently, travelers, students, all whose homes are in hotels and boarding-houses, and even many who have good private homes, turn toward good hospitals when they see the need approaching for prolonged and special care. For the wants of such persons provision has been made in the wards here set apart for paying patients, male and female.

This hospital would be a very narrow institution if it kept to itself its experience. It is the essence of quackery to deal in mysteries and nostrums; it is the glory of medicine that it owns no patents and conceals no discoveries. On the contrary, the best hospitals of the world consider it among their first duties—second only to the care of their patients—to record the cases they have treated, the methods they have pursued, the results, whether favorable or unfavorable, which have followed. Scientific studies in pathology and practical medicine must be printed. Special papers, often requiring costly illustrations, must be published upon extraordinary cases, and upon new operations and modes of relief. It is thus that the science of medicine is advanced. Where secrecy reigns, carelessness and ignorance delight to hide; skill loves the light.

It is impossible to have a hospital without its becoming a place for medical education. It is

interesting to note that in the physician's oath, attributed to Hippocrates, the duty of imparting knowledge is explicity enforced. Even the country doctor, as he rides from village to village, takes in his gig an observing pupil, like the squire to a knight errant. Every great surgeon is watched with the closest attention by the younger physicians who assist him. Every mother is the pupil of the physician whom she calls upon to attend her suffering child. So, of course, a hospital, having upon its staff men of rare qualifications, who are in daily consultation with their most skilful brethren, is, from the necessities of the case, a place for instruction. How systematic that instruction will be depends on circumstances that at the moment need not be presented. All that need now be said is that hospitals the wide world over are the schools of medicine and surgery.

The training of nurses is another form of hospital activity, recently developed, never hence to be abandoned. To the sisterhoods of the Roman Catholic Church, to the Protestant deaconesses of Kaiserswerth and the *Bethanien* at Berlin, and to many gilds in many lands, much credit is due for lessons they have taught the world as to the importance of training nurses. Elizabeth Fry was one of the first Englishwomen to propose such instruction. Florence Nightingale, by her services in the Crimean war and by her subsequent writings, has borne a noble part in this work. So, too, have our own countrywomen. The civil war, full of sad recollections, has some bright stories,

and among them none more inspiring than the labors of brave, self-sacrificing, and intelligent women in the hospitals. Who that read "What We Did at Gettysburg," or "Hospital Days," has forgotten their lessons? As a direct result of the war, nurses' schools have grown up in every part of this land. Our hospital has such a department soon to be opened, where nurses will be trained not only for their merciful offices within these walls, but for household engagements and for visiting among the poor.

A good hospital may readily become the rallying-place of the medical profession who are resident in the city.

> Through mutual intercourse and mutual aid
> Great deeds are done and great discoveries made;
> The wise new wisdom on the wise bestow,
> Whilst the lone thinker's thoughts come slight and slow.

One purpose of this central building is to afford opportunities for professional intercourse. Here are rooms set apart for the library that will presently be collected; here the medical journals will be taken in; here are the best appliances and instruments for the treatment of patients; here are rooms for private consultations and for public conferences; here are laboratories for physiological and pathological determinations; and it will not surprise me to hear that within a very short time medical associations are here brought together for mutual intercourse and mutual aid, at the invita-

tion of Dr. Osler, the physician-in-chief, who this day assumes his great responsibility, with the hearty welcome of Baltimoreans, and with the well-earned confidence of the profession throughout the entire land.

Reference must also be made to the lessons that this hospital has already given to the world before a single patient has been received. The vast amount of thought bestowed upon these buildings, not only in their general arrangements, but in thousands of details which promote their efficiency, has not failed to attract the attention of observers from every part of the globe. The letters which have been received during the last few days from the most distinguished surgeons and physicians abroad, and the presence of this large body of medical men from the distant cities of the United States, are indications of this interest.

Finally, if this hospital becomes the seat of knowledge in all that pertains to the nature of disease, its treatment, its prevention, and its cure, it will of necessity be a constant guide to the people of the city and the State in which it is placed; it will promote the general health of the inhabitants. There is an altar in one of the churches of Messina which bears an inscription to Æsculapius and Hygeia, the god of medicine and the goddess of health; and their statues are found together on the façade of Guy's Hospital.

Is all this outlay wise? I might answer an inquirer in the words which Wordsworth employed in speaking of King's Chapel, one of the most costly structures in the University of Cambridge.

Knowledge and Charity

High heaven rejects the lore
Of nicely calculated less or more:
Tax not the royal saint with vain expense;
With ill-matched aims, the architect who planned
This glorious work of fine intelligence.

For in this hospital, as in that church, are

Thoughts whose very sweetness yieldeth proof
That they were born for immortality.

But I prefer to give a more specific and appropriate reply to those (if any such there be) who say: "I believe in everything that is practical, in whatever leads to the relief of suffering; but I am afraid of this talk about science. I would rather see a thousand beds for patients than any provision for medical education." Such reflections are to be heard with respect, for they are natural to minds unacquainted with the intimate relations which subsist between the progress of medical knowledge and the progress of medical art. Nevertheless it is true that those who have most carefully studied the conditions by which human life is perpetuated, human sufferings lessened, and human vigor increased, are well aware that every step forward in science leads to many forward steps in practice. May I mediate between these divergent views, and bring a few illustrations from the doctor's shop to the attention of those who are practically interested in hospitals, but who have paid no attention to the steps, so slow, so difficult, so uncertain at first but so sure at last, by which the healing art makes progress?

The late Dr. Austin Flint of New York, in an address prepared near the close of his life, has

pointed out with the wisdom of experience the probable future of medicine. It would be presumptuous for me to attempt to do again what he has done so recently and so well. But on this day of promise, in view of all this expenditure, it is fitting that we should bring to mind some inspiring thoughts.

Let us first consider the benefits which have come to mankind from the opportunities which hospitals have afforded for the observation of disease. There is no one among us more competent to speak upon this subject than the pathologist of this hospital, Dr. William H. Welch, who, years in advance of its opening, has been engaged as a professor of the university in the study of the nature and origin of disease. He has called my attention to these noteworthy points:

Those who have contributed the most to the advancement of practical medicine and surgery have accumulated their experience largely in hospital service. By the constant attendance of skilful physicians and of well-trained nurses in hospitals, precise observations can be made, and the phenomena of disease and the influence of treatment determined under the most favorable conditions.

Our present knowledge of the natural history of disease, of its diagnosis, prognosis, and treatment, is based to a very large extent upon experience derived from hospitals. Text-books, monographs, and medical journals incorporate this experience and bring it to the knowledge of the medical profession. This is why intelligent physicians are always eager to secure the advantages of a hospital service.

Knowledge and Charity

The benefits which medicine has received from purely scientific investigations may be shown by so many examples that it is difficult to make a selection among them. Dr. Welch mentions these:

Upon the foundation laid by Helmholtz's researches in physiological optics, and his discovery of the ophthalmoscope, the art and science of ophthalmology have developed into the most accurate department of clinical medicine.

The investigations which received their impulse from Du Bois-Reymond in the difficult subject of animal electricity have rendered electricity available for diagnosis and treatment, and have advanced thereby our knowledge of nervous diseases.

Of the many ways in which the work of the chemist has aided medicine may be cited, as one of its most recent contributions, the introduction into modern therapeutics of many useful remedies which are the products of synthetic chemistry. Doubtless this is a field which will be cultivated still further, and it would be rash to attempt to foretell what agents for the cure of disease and relief of suffering are still hidden in the chemist's laboratory.

By the discovery of the specific germs causing various infectious diseases, surgical practice has been revolutionized. It has become possible to prevent the infection of wounds from the exterior, and thus to guard against a host of traumatic infections which rendered dangerous and futile so many surgical operations. Preventive medicine has taken its place among the exact sciences.

Accurate knowledge of the causes of disease now forms a sure basis for intelligent therapeutics, and there is every reason to expect that the future will bring to light means to overcome the injurious agents which are now, for the first time, known.

But there is another illustration so marvelous that it may almost be called miraculous. The relations of advancing knowledge to advancing charity are brilliantly displayed by the history of methods for the relief of pain.

To put a stop to suffering is an instinct of human nature, distinguishing man from animals. The most scientific men and the most practical are agreed upon this, and have been so agreed for centuries. But Anæsthesia, most welcome of all the angels of mercy, came down from heaven. When the older surgeons in this assembly were students, opium and alcohol were the imperfect anesthetics most usually employed. Their use was restricted and unsatisfactory, if not dangerous. No one can tell what was suffered in places where gentle sleep now quiets apprehension and makes the patient unconscious of his state. To this alleviation we are so wonted that we accept it as the air we breathe. But if you would learn how man secured this boon, how many efforts of scientific and of practical men were combined before the results were reached, recur to the history of four modern agencies, nitrous oxide, ether, chloroform, and cocaine, which are like "the gentle dew from heaven, which blesseth him that gives and him that takes." It is a chapter more wonderful than any romance of the Arabian Nights.

Let any one present who is skeptical in respect to the usefulness of science to the healing art keep this record in his mind. Let him reflect on the apprehensions that have been removed not only

from the patient, but from his attendant friends; let him see how much easier, and therefore how much more certain, the task of the surgeon has been made; and, above all, let him think of the hours of pain that have been absolutely annulled, and then let him divide the honors, if he can, which belong to science from those which belong to philanthropy; let him balance half a century of scientific relief with the previous practice of many thousand years; then let him tell us which is better.

From the past let us turn to the future. All the signs of the times point to a new era in the history of humanity. All the sciences are leading up to a better understanding of the laws of life, to a truer anthropology and the consequent improvement of the physical, mental, and moral powers of man.

There are four or five directions toward which we may turn an expectant gaze, as in days gone by the merchants watched upon the housetops for the return of the ships they had sent out to distant ports.

Preventive medicine promises to do more and more for mankind. As the germs of many specific disorders have been discovered, so the means of their destruction have been found out. If legislation and civil administration keep up with science, if knowledge is controlled by virtue and followed by temperance, the community will be freed from many of the foes which in former generations have slain their tens of thousands.

From the chemical laboratory new remedies, as well as simpler forms of old remedies, are to be

constantly looked for. The synthetical processes which now receive so much attention have lately made important contributions to the pharmacopœia. It would surprise any one whose attention has not been directed to this point to know how many claimants are awaiting judgment. Scores of substances, till lately unknown, as I have heard my colleague[1] say, are awaiting the study of competent therapeutists. Nobody can foretell what will come from their new contributions to materia medica, but one who watches the processes of discovery must feel certain that secrets hidden from the beginning are ere long to be revealed, and that many of the substances already discovered have properties of the most serviceable character.

No one can say what will result from the attention that has been recently given to the study of psychical phenomena by the exact methods of science; but the outlook is hopeful. If we are as far as ever from elucidating the mysterious interrelationship of the mind and the body, progress has certainly been made in a knowledge of the laws by which they act upon each other. The knowledge that has been acquired in respect to the functions of the brain and nervous system has already led to the treatment of many disorders and the relief of many diseases which a short time ago were beyond the reach of remedy. We are not without hope that in the physiological and psychophysical laboratories already established here important contributions will be made to science

[1] Professor Remsen.

which will ultimately prove to be of value to medicine and to the conduct of the body in health and disease.

Medical appliances and surgical instruments are greatly to be improved. A surgeon who has just returned from Europe, after visiting in the interest of this hospital the most celebrated instrument-makers, has informed me that the processes of manufacture even now are behind the devices and requirements of surgical science. The hands of the artisan have not kept up with the brains of the chirurgeon. It is not possible to buy ready-made the instruments required by this hospital.

In the near future we are to look for progress in the applications of electricity and magnetism to the treatment of disease as well as to its diagnosis. Chemistry by its synthetic methods is producing new remedies, which experimental therapeutics proceeds to test, and pharmacy then appropriates. The laws of light, heat, electricity, and magnetism are found in close relationship to the problems of relief and cure. The laws of temperature and climate have their services to render. Even the influence of barometrical pressure upon surgical operations begins to be noticed. The study of the nervous system is sure, at no distant day, to make important contributions to the welfare of man. Psychology is waiting for the results. Experimental physiology is doing its part. Pathology, a term as old as Hippocrates, has become a new science within the last few years. The laws of descent have but just begun to assume a scientific form.

Preventive medicine is almost a new conception. The morality of personal hygiene is a new department of ethics. Biology, after having met with the same critical reception with which anatomy, astronomy, geology, and chronology were greeted, may yet be honored as leading to the highest and noblest conceptions of humanity; anthropology, and the knowledge of man in his relations to the universe in which he is placed, may sum up finite knowledge.

So all along the line, in the laboratories of the university and in the wards of the hospital, knowledge is contributing to the welfare of man. The days of the coming man may not always reach the full allotment to which Chevreul has just attained, but perhaps to die at seventy will be to die in youth, and to reach the age of eighty or ninety in health and vigor will be the rule and not the exception. Nor is length of days our only hope. The disappearance of epidemics, fewer days of confinement in sickness, fewer "minor ailments," a decrease of infantile mortality, greater powers of resistance to the evils of certain occupations, comparative immunity from many infirmities which are now common, artificial reinforcements and replacements of bodily defects, simpler and surer means of diagnosis, the detection of the nature, origin, and history of specific affections, and finally the assurance of euthanasia—these, as it seems to a layman, are reasonable expectations which the nineteenth century holds out to the twentieth. Can any outlay be too great if humanity is thus benefited?

To the attainment of these noble aims, "the advancement of learning and the relief of suffering," the foundations of Johns Hopkins are forever set apart. On the one hand stands the university, where education in the liberal arts and sciences is provided, and where research is liberally encouraged; on the other hand stands the hospital, where all that art and science can contribute to the relief of sickness and pain is bountifully provided. Is there anything wanting? Yes; there is still a great want to be supplied, an arch to rest upon these pillars. An institute of medicine and surgery, a college of physicians and surgeons, a medical school, the office of which shall be to promote the training of young physicians and the encouragement of medical science, is imperatively needed. Is it too much to say that there is not such an opportunity on the face of the globe for another Peabody or another Hopkins to benefit his fellowmen?

The university needs all it has, and more, to carry on the non-professional courses to which its funds are appropriated. The hospital, with all its readiness to coöperate in the advancement of knowledge, will, after all, remain, as I have said before, and cannot say with too much emphasis, the home of the sick, the feeble, the injured, and the dying. It is the house of mercy, not the hall of philosophy. But in close alliance with both these foundations there is a place for a school of medicine, which may bear its founder's name, and may render services as significant and memorable as those of Salerno

and Bologna, at the beginning of the modern era; as those of Leyden and Edinburgh, where the earliest American physicians received their education; or as those of Berlin and Vienna, to which so many students of this decade resort.

This grateful city should no longer delay placing upon one of the squares, near the monument of Washington, the figure of Johns Hopkins, with such designs as an artist, and an artist only, could devise to typify the great ideas which underlie his gifts—"the advancement of learning and the relief of suffering." Then might some friend of this hospital place beneath this dome a copy of Thorwaldsen's "Christus Consolator," with the outstretched hands of mercy, to remind each passer-by —the physician and the nurse as they pursue their ministry of relief, the student as he begins his daily task, and the sufferer from injury or disease—that over all this institution rests the perpetual benediction of Christian charity, the constant spirit of "good will to men."[1] Upon one hill of Baltimore rises a temple, "whose guardian crest, the silent cross," is an emblem of the Christian faith; upon another, a lofty column reminds us of the patriots' hope; upon a third, the hôtel-Dieu is placed, the house of charity. Here abideth faith, hope, charity; but the greatest of these is charity.

[1] Several years later, a copy in marble of this statue was placed in the Johns Hopkins Hospital by the liberality of William Wallace Spence, Esq., of Baltimore.

MODERN PROGRESS IN MEDICINE

AN ADDRESS AT THE OPENING OF THE HUNT MEMORIAL BUILDING,

HARTFORD, CONNECTICUT, FEBRUARY 1, 1898

The building referred to in this address commemorates Dr. E. K. Hunt, one of the best physicians of Hartford, a graduate of Yale in 1833, and at one time president of the Medical Society of Connecticut. It was a generous gift to the medical profession, where their meetings may be held, and where a library and laboratory may be maintained.

MODERN PROGRESS IN MEDICINE

THE occasion which has brought us together will add to the distinctions which have given to Hartford its enviable rank. This memorial hall, a home for the medical faculty, a place for their investigations, associations, and recollections, will be through them a benefit to every inhabitant of the city. As a center of life and light, it will be an example to other parts of the State, and even at a distance. Dublin, Edinburgh, and London have their halls of medicine, where portraits, statues, and other memorials of illustrious physicians and surgeons are the ornaments of libraries, museums, and laboratories. Similar flourishing institutions may be found in Boston, New York, Philadelphia, and Baltimore; but Hartford (so far as I know) is the first city at a distance from a school of medicine to secure a place of assembly for the members of the profession, where they can know and advise with one another, gather up the experience of the past, become acquainted with current journals and memoirs, and make such accurate scientific obser-

vations as in these days are essential to those who practise the healing arts.

As a layman, inexpert in the details of medical science, I should hesitate to accept the invitation extended to me by your honored representative,[1] were it not that twice I have been at the head of a medical faculty and once at the head of an important hospital. I have thus been brought into familiar relations, in this and other countries, with some of the leaders of the profession, and have visited not a few of the hospitals, clinics, libraries, and laboratories which are exerting a powerful influence upon the progress of medicine. I know something of the wants, the difficulties, the methods, the achievements, and the anticipations of the medical faculty; I know the spirit of humanity which governs their lives; I honor their devotion, their enthusiasm, their learning, and their skill; and I am glad to render this humble tribute of admiration and gratitude to those whose lives are consecrated to the service of suffering men and women, and whose steady aim in these enlightened days is to prevent *in toto* those very disorders which it is their business to eliminate and cure. I do not know of any other workmen who make it their first duty to stop the sources of supply from which they derive their income. Go where you will, in the most remote village or in the most cultivated society of the capital, the physician is the man of men on whom you may, as a stranger,

[1] My lifelong friend and your distinguished ex-president, Dr. Melanchthon Storrs.

most surely rely for counsel, courtesy, sympathy, and a large humanity which is not restricted by race or color, by creed or party. You may likewise be sure that he is striving, might and main, to prevent as well as to cure. Stevenson, in a striking passage, has recorded his obligations to those whom he has found in many lands so considerate and helpful; and Ian Maclaren, after his long lecture tour in America, declared that wherever he went some one would say that he knew, in his own town, the original Dr. Weelum MacLure of Drumtochty.

In the presence of so many medical men, you must understand that I speak as one who is not of them, but among them. I shall try to show them how an outsider looks at the progress of their art and estimates their advances; and, as an outsider, I shall try to keep free from the Latinity in which their prescriptions are written, and from the sonorous terms of Hippocrates, still employed in medical parlance, although some of them were pilloried long ago by Whewell, in an amusing paragraph, as examples of the mode in which words involve obsolete opinions.

I ask you to follow with rapid glances the progress of medicine in modern times—not its minute investigations and discoveries, nor its treatment of cases, but some examples of its giant strides, a few of the epoch-making advances which have contributed to the well-being of all the inhabitants of civilized lands. In order that this broad survey may be of local interest, let me choose, as an initial mile-stone, the settlement of Connecticut in 1636.

The founder of Hartford, wise, gifted, and renowned Thomas Hooker, pioneer of church and state in this wilderness, was the contemporary of William Harvey, illustrious discoverer of the circulation of the blood, whose insight and reasoning have guided all modern medicine—noble Harvey, learned, acute, skilful, discerning, upon whom the world cannot bestow too much gratitude and honor.

It is an interesting though not an intended coincidence that this assembly of physicians and their friends commemorates the three-hundredth anniversary of a noteworthy incident in Harvey's life. In 1598 this bright English student entered the University of Padua (which was to Venice as Cambridge is to Boston, or as New Haven is to Hartford), then having a school of medicine made attractive by the fame of Vesalius and Fabricius, renowned leaders of anatomical science. Quite recently a professor in Padua has revealed two memorial tablets, long concealed on one of the cloistered walls, and inscribed with Harvey's name and nation. Above is this Æsculapian symbol—an outstretched arm holding a lighted candle between two serpents. Alas! Dr. Hammond Trumbull is no longer here to interpret this heraldic device. It seems to me to signify "light shining among the powers of evil." A copy of that *gemma* would be an appropriate decoration for this hall.

I have no evidence that Thomas Hooker ever met his senior, William Harvey, but he may have done so, for they were at the University of Cam-

bridge in the same decade, and Hooker did not quit England until five years after Harvey's discovery was announced in print. Walter Savage Landor might have composed an Imaginary Conversation between them in this fashion:

HOOKER: "Tell me, Dr. Harvey, the secret of your discovery."

HARVEY: "There is no secret. I only searched for truth, and, when discovered, made it known to others."

HOOKER: "Can I follow your example in religious doctrine?"

HARVEY: "Surely, young divine; think of nothing but the truth. The light will shine even in a wilderness, and will deaden the powers of evil."

We speak in these days of the circulation of the blood very much as we speak of the circulation of the air, the tides, and the currency—obvious phenomena familiar to every one; but few of us recall the mysterious ignorance which rested upon the problems of interior and invisible life before the days of Harvey. Even the dissection of tissues from which life had departed awakened, as late as Vesalius, opposition and apprehension.

Modern medicine began with Harvey's discovery. He first established the fundamental doctrine of animal physiology. His key unlocked, not all, but many, of the mystic chambers of the human castle. He revealed the secrets of the heart. Thenceforward the knowledge of respiration, digestion, and nutrition, the office of medication, and the arts of surgery rested upon a principle which was as firmly

established as the potency of the sun in the solar system.

To appreciate the epoch-making character of Harvey's discovery, which was not an accident, but a result of tedious, prolonged, and skilful observations, it is well to inquire into the theories respecting physiology and medicine which were prevalent in the first half of the seventeenth century, the years when Thomas Hooker was studying in Emmanuel College or preaching in Chelmsford. Medical men know well enough where this information can be found, but the laity need not turn to professional archives. They may obtain significant glimpses of what was then current among intelligent people respecting medicine by a reference to the writings of Shakspeare and Bacon.

Shakspeare's death was almost synchronous with Harvey's first appearance as a Lumleian lecturer in the College of Physicians. The medical allusions of Shakspeare have been studied by several authors,—Da Costa, Aubert, Moyes, Thompson, and Stearns,—and I shall not dwell upon them, preferring the authority of a philosopher and historian to that of a poet and dramatist. I know of no evidence that Harvey and Shakspeare were acquainted, but Harvey and Bacon undoubtedly knew each other. While the anatomist was pursuing those inquiries which were to make a revolution in medicine, the author of the "Advancement of Learning" was regaling his comprehensive intellect with precious morsels of inherited superstition. Read his "Inquiry concerning Life and Death,"

especially the fifth section, and the thirty-two directions which were taken by the great philosopher (as he says) "for his own use out of the book for the prolongation of life." "Mithridate, thrice a year," was one of these injunctions. And what was "mithridating"? Any good dictionary will answer.[1] "The Grains of Youth" was another of Bacon's now astounding prophylactics.

But these were simples compared with "methusalem water," which was, so far as I can make out, and as its name "methusalem" implies, a kind of life-assurance against what is called by Bacon "the dryness of age." Unfortunately either the precept or the practice was at fault, for my Lord of Verulam and St. Albans did not live to reach the appointed "seventy." Here is a condensation of the receipt for this extraordinary beverage, more mysterious and complicated, I venture to say, than any product of the pharmacopœia or of any modern American bar.

Two powders and a solution are to be prepared, and this is how:

First. To crab-shells, boiled in claret, flavored with rosemary, dried and powdered, add pearl, steeped in vinegar and likewise dried and powdered. Put in a little gin-

[1] From Mithridates, the famous Persian king, who is said to have invented a general antidote against poison by mingling many poisons. Buffon, in his "Natural History" ("Oiseaux," xvii, p. 234), says that the blood of a wild duck was the basis of this electuary, because the ducks in Pontus fed upon all the poisonous herbs which that country produced, and thus their blood acquired the power of resisting poisons. Some have seen in this the germs of modern serum-therapy. Cf. Littré, *sub voce* Mithridates.

ger and white poppy-seed, and steep again in spirit of wine flavored with saffron. Evaporate the spirits and dry the powder in the sun; add niter and amber-grease, and keep the resultant in a clean glass ready for use.

Second. Steep cucumbers in milk and draw forth water by distillation.

Third. Take a pint of claret and quench gold in it four times.

Mix these three ingredients, and drink the potion in the morning. Stir up the powder when you drink, and walk upon it.

It was on such serpentine instructions as these that the light of Harvey's candle shone.

I cannot pass to another theme without saying that an acquaintance with Harvey's experiments, so rich in contributions to our welfare, so fruitful in benefits to humanity, would convince any intelligent person that if the discoverer of the circulation of the blood had lived in the court of Queen Victoria, instead of Charles I's (perhaps I may say near the precincts of our national Capitol), bishops and ministers of state, women of fashion and men of letters, would have rallied the forces of prejudice and ignorance so as to delay and probably to thwart one of the most important and serviceable discoveries that the human intellect has ever made.

In Connecticut, this favored land of wooden clocks and Waterbury watches, and in these days of almost infallible chronometers, it is worth while to note that Harvey had no good method of measuring small fractions of time, timepieces having

hour-hands only. The merest tyro can now count the pulse more precisely. Time was measured, under these circumstances, by repeating some familiar verses of Scripture or so many prayers. For this and much more curious lore, consult the "Life of Harvey," by Mr. D'Arcy Power, a capital introduction to the history of English medicine, to which I have been indebted for many of my allusions. He quotes this passage from Dr. Norman Moore's remarks upon an ancient breviary of St. Bartholomew's Hospital:

> The mixture of prayers with pharmacy seems odd to us; but let it be remembered that Mirfeld wrote in a religious house, that clocks were scarce, and that in that age and place time might not inappropriately be measured by the minutes required for the repetition of so many verses of Scripture or so many prayers. Thus Mirfeld recommends that chronic rheumatism should be treated by rubbing the part with olive-oil. This was to be prepared with ceremony. It was to be put into a clean vessel, while the preparer made the sign of the cross and said the Lord's Prayer and an Ave Maria. When the vessel was put to the fire, the psalm "Why do the heathen rage" was to be said as far as the verse, "Desire of me, and I shall give thee the heathen for thine inheritance." The Gloria, Paternoster, and Ave Maria are to be said, and the whole gone through seven times. Which done, let that oil be kept.

Dr. Moore has measured the time involved in these instructions, and found it to be a quarter of an hour.

This inability to count the pulse with accuracy

leads me to remark, in the second place, upon the gains that have been made since Harvey by the use of instruments of precision in medical practice, and by inventions and improvements in the form and material of surgical implements. The touch and stroke of a skilful hand and the vision of a discerning eye are as precious now as they were in the days of Hippocrates; but the power of the eye, the ear, and the hand has been enormously augmented by ingenious devices, often, but not always, proceeding from those who are unfamiliar with hospitals and clinics. Such inventions and processes the medical faculty quickly recognizes and appropriates, so that suffering is relieved by the progress of the mechanical arts and the improvements of manufacturing industries. Spinoza, the philosopher and theologian, grinding lenses for a living, may have been contributing to the advances of surgery. A lecture might be devoted to this subject, but I have only time to indicate some of the most noteworthy auxiliaries that have thus been enlisted.[1]

First in chronology, if not in importance, is the compound microscope, still king of the realm, indispensable as the lancet, but not as dangerous in unskilful hands; the perfection, duplication, and adjustment of the burning-glass of Archimedes, revealer of the nature of tissues and secretions, of bacteria and other germs, which enables the practitioner to affirm or deny that which could only be

[1] Consult Dr. Weir Mitchell's address on "Instruments of Precision," which came into my hands after the address was delivered.

guessed without its aid. Next, the successors of the compound microscope, ingenious instruments adapted to the study of special organs—the eye, the ear, the nose, the throat, the pelvis. Chief within this group is the ophthalmoscope of Helmholtz, which has revolutionized the treatment of disordered vision, revealod certain lesions of the brain, and served as the detective of some insidious diseases before their obscure operations could be otherwise discerned. Then comes the misnamed stethoscope, a sort of precursor of the telephone, which enlarges the power of the ear as the lens enlarges the power of the eye, and whose telltale whispers reveal far more than the voice or the cough of the patient respecting his true condition. Likewise the clinical thermometer, inexpensive, self-registering, and revealing with extreme accuracy the variations of bodily temperature, so that the physician, absent for many hours from a bedside, may study as if he had been present the course of a fever. Finally, photography by X-rays, a discovery not three years old, already in many cases a serviceable instrument of surgical diagnosis. To these instruments of precision must be added the various forms of electrical apparatus which are found serviceable in the treatment of certain diseases. All these captives medicine has taken from the domain of physics, and they are captives that will never be released from the service they have entered.

Surgery also owes much of its progress to improvements in metallurgy, to ingenious adaptations

of the principles of mechanics, and to the skill of artificers; but I was taught as a boy to be careful how I "played with edged tools," and I am particularly careful when I enter a surgeon's clinic. My purpose is accomplished if I have led you to perceive how closely medicine and surgery are connected with the progress of the mechanic arts, and what marvelous gains have been made from the workshops of braziers and cutlers, as well as from the laboratories of pure science. Chemistry has yielded its contributions, but you understand that here I am speaking only of mechanics and physics.

A third illustration of medical progress may be found in the history of inoculation. Early in the last century, as for centuries before, smallpox was one of the scourges most dreaded by civilized people. Then it happened that an English lady, whose beauty had been impaired by this horrid disease, observed, while she was traveling in Turkey, that the pestilence was there held at bay by a simple, efficacious, and usually harmless process, quite unknown in western Europe. From Adrianople, in 1717, she wrote to London describing the operation and its effects. This introduced to the Occident the Oriental safeguard. It was a priceless boon; but its importance is obscured by the greater benefit to which it led. Eighty years passed on, and then another discovery, the immortal work of Edward Jenner, first given to print in 1798, convinced the world that a simpler, less painful, less risky, and equally efficient preventive was found in vaccine. Ere long vaccination completely

took the place of the Turkish process, and spread the wide world over.

But the story does not end here. During eighty years, more or less, after Jenner, vaccine was almost the only form of inoculation employed in medical practice. Then came the wonderful, the life-giving researches of Lister, Pasteur, and Koch, their associates and followers, and the consequent introduction of antitoxin treatment by Behring and Roux.

Thus the possibility of artificial immunization from diseases in men and animals is obviously an extension, by modern science, of the principle of inoculation introduced to England by Lady Mary Wortley Montagu, and developed by Edward Jenner when he annihilated the dread of that fearful scourge by transferring to the arm of a boy the virus from a milkmaid's hand. It is by these new forms of inoculation that medicine has of recent years made some of the most important gains. The successful treatment of diphtheria and that of diseases of the thyroid gland are conspicuous examples of the practical value of experimental investigations.

The fourth of the great advances of modern medicine is the annihilation of pain in surgical operations, by which the patient is relieved from apprehension and suffering, while the efficiency of the treatment is promoted. Hartford has the glory of making this discovery, for, as you well know, it was here that Dr. Horace Wells, on the 11th of December, 1844, inhaled laughing-gas and lost without pain a wisdom-tooth. "On that day," says Dr.

McManus, "modern anæsthesia was given to the world, and nitrous-oxide gas proved to be a blessing to suffering humanity, and the forerunner of all anesthetics"; and the memorial tablet succinctly states that it was Wells who "discovered, demonstrated, and practised the benefits of anæsthesia."

In these days, when experiments upon animals are opposed by uninformed persons, it may be worth while to speak of this act of Dr. Wells as an "experiment upon a living animal," the man himself, perhaps the most significant and valuable experiment that has ever been made.

To the use of nitrous oxide, the use of chloroform, ether, and cocaine has succeeded, and each in its way has proved to be an inestimable blessing.

Fifth, I speak of the wonderful advances made within the last few years by the study of those minute organisms which are known as bacteria, and of their relations to disease. As soon as their nature was clearly recognized, and their life-history made out, the next step was to thwart the activity of such as are harmful, prevent their growth, and restrict their migrations.

I remember well the remark of a distinguished surgeon, several years ago, to this effect: "Every surgical nurse should have laboratory lessons in bacteriology." "Why so?" said an inquirer, to whom the suggestion was new and surprising. "Because," was the surgeon's reply, "if an attendant has seen two instruments sterilized—and one of them applied to a sterilized culture-medium without touching any object, while the second of them hits the sleeve

of a coat before its introduction into the like medium—the observing attendant will receive a lesson that she can never forget."

"It would be a long story," said my colleague, Dr. Welch, in a recent address at Chicago, "should I attempt to rehearse the useful discoveries in this domain: how Pasteur saved the silkworm industries of France by his studies of a microscopic parasite; how agriculture and dairies and industries concerned with fermentative processes have been benefited; how preventive inoculations have saved the lives of thousands of animals; how surgery has been revolutionized by Lister's application of Pasteur's discoveries; how the scientific study of immunity has opened up new vistas in preventive and curative medicine, as exemplified by the antitoxic treatment of diphtheria and preventive inoculations for rabies, which have led to the saving of untold thousands of human lives."

The progress of preventive medicine is the sixth point to which I call your attention. Nowadays it is not enough to relieve the sufferer. All the forces of society, legislative, administrative, statistical, and medical, may be, and should be, and often are, successfully combined to discover and check the progress of pestilence. Not every scourge has yet come under control (the grippe, for example, still justifies its name); but smallpox need not be prevalent, cholera can certainly be restricted, typhoid fever held in check, and diphtheria reduced in its potency and range. It is now established that the purity of drinking-waters can be and must be

secured, and that it is not the ordinary eye and taste that can be trusted as censors, nor even the chemist's analysis. The microscope and the culture-tube of the bacteriologist must be brought into service as detectives if the obnoxious germs are to be recognized; and the ordeal, not of frost, but of fire, must be employed for their extinction.

Seventh, I mention the progress that has been made in the treatment of diseases of the brain and nervous system, due to the minute anatomical researches of later years, and, among them, to the localization of the functions of the brain. The time is not beyond the memory of those now living when a "crazy person" was looked upon almost as a helpless outcast, to be confined and possibly manacled, and when concealment of such disorders was deemed of great importance. "Most of us can remember," says a high authority, "using very imperfect physiological knowledge to fix, more or less successfully, the locality of an organic lesion in the brain. I also remember such attempts being described as a mere scientific game, which could only be won after the player was beaten, since, when the accuracy of diagnosis was established, its object was already lost; but who would say this now, when purely physiological research and purely diagnostic success have led to one of the most brilliant achievements of practical medicine, the operative treatment of organic diseases of the brain?"

Time should have been reserved for the subjects of physiological chemistry and pharmacology, which have done so much in recent years to eliminate

the needless, simplify the essential, and mollify the offensive elements of materia medica, and to introduce new and efficacious remedial agents.

I will not prolong this review of the progress made since Harvey and Hooker were students in the University of Cambridge. Your attention has been called to the prime discoveries of modern medicine, to the introduction and development of preventive and curative inoculation, to the use of exact measurements, to the boon of anesthetics, to the effects of antiseptic surgery, to the growth of public hygiene and preventive medicine, and to the treatment of disorders of the brain and nervous system. Other advances I pass by, that I may reserve a little while in which to expound the education required for a modern physician if he would be expert in understanding and applying these advances in his practice, and especially if he would make still further contributions to the healing art.

The history of modern medicine has no lesson more important than this: accurate knowledge of facts leads to the discovery of preventions, alleviations, and remedies; and pure science, or the search after absolute truth, is the precursor of improvements in practice. Listen to the examples which are given by a distinguished practitioner, Dr. P. H. Pye-Smith, in the Harveian oration for 1893. Harvey's discovery underlies the use of auscultation. Du Bois-Reymond's investigation of the electrical properties of muscle and nerve was purely scientific, but the results of it are used every day in the diagnosis and treatment of disease, and in the

demonstration of the falsehoods by which the name of electricity is misused for purposes of gain. The experiments on blood-pressure, begun by Hales and carried on by Ludwig, have led to knowledge which is used every day by the bedside. Bernard's discoveries of the diabetic puncture and of the digestive function of the pancreas await their practical application.

When I lived in Connecticut in the days of Dr. Hawes, it was not unusual, if the sermon had been dry, to give notice of coming relief by some prognosis like this: "With two or three practical applications I shall close." So I bring my discourse to an end with "two or three practical applications."

In the first place, upon all who are looking forward to the medical profession, for themselves or for their wards, I would impress the notion that this is a calling which gives employment to the utmost capabilities of human nature—all that is best in physical, intellectual, moral, and social characteristics. It exercises the finest powers of sympathy, memory, imagination, observation, reflection, and judgment, and it exacts from those who would be its leaders varied and prolonged training in books, in laboratories, and at the bedside.

Medical science is very complex; it is rather a network of sciences. In these days most rapid advances are made. He who wishes to keep up with the procession must be well trained and nimble, sure of foot and on the outlook for dangers. Medicine and surgery are based on pathology; pathology rests on physiology, physiology upon chemis-

try, chemistry upon physics, and physics upon mathematics. He, therefore, who looks forward to the highest success in his profession must lay a good foundation, while he is yet a boy, in his geometry and trigonometry, partly because of their logical value, partly because the laws of physics, including electricity, are written in mathematical terms. Chemistry likewise involves the most accurate statements. After these preliminaries the candidate must have a long period of practice in experiments and demonstrations by the use of the balance, the retort, the battery, the galvanometer, the microscope. Moreover, it is indispensable that he should have a good command of English, French, German, and Latin. Logic will teach him how to reason; history and literature will refresh his weary hours. After this he must take up biology and study the structure and functions of animals and plants, observing how living beings, lower in rank than the human species, perform their normal and healthy functions. Such knowledge may not be acquired in the lecture-room or wholly from books. It must be gained by personal work in the various laboratories, where alone the student can acquire a thorough knowledge of the structure and functions and chemical composition of the normal and diseased body, of the lowly micro-organisms which cause infectious diseases, and of the composition and physiological action of drugs and other remedial agents.

Then comes the proper professional study, including every department of medicine and surgery,

extending to the obscure diseases of every organ and to the appropriate treatment. These professional studies must go forward in connection with the hospital and dispensary, so that knowledge which can only be acquired at the bedside and in the operating-room may be accumulated. Such an education will not be complete without an introduction to the history of medicine and to medical jurisprudence. Sanitary science, in its relations to the welfare of the community, is also an indispensable branch of study.

Now it is hardly possible to secure this liberal and professional education in a shorter period than eight years, four of which may be spent in the preparatory college and four in an institute of medicine. Not less than this amount of labor and devotion will be required, in the near future, of all those who wish to become the leaders in their profession.

Let me also say a word to the public at large. Modern medicine is preventive as well as curative. An ounce of prevention is worth a pound of cure. Slight ailments neglected are like rents in a fabric. Therefore subscribe to a physician, a quarterly, monthly, or weekly adviser, that he may keep you well if he can, or at least check your bad tendencies, and perhaps prepare you, not to escape the grasp of Mors, but to anticipate an euthanasia.

There is a tradition that a swarm of bees settled upon the tomb of Hippocrates, and that children anointed by their nurses with the honey there stored up were cured of certain diseases. So may

this memorial hall be a place where the bees will come to make honey for the healing of all whom they can reach. The Hippocratic oath has come to us from remote antiquity. I will not swear in its words, by Apollo, the physician, by Æsculapius, or by any other gods and goddesses, but I will pray, in the words of that venerable *sacramentum*, that the members of this society "may be prosperous in life and business, and be forever honored and esteemed by all men, as they observe and not confound their solemn obligations."

Now let us return to our mile-stone, the coming of Thomas Hooker to Hartford, in the days of William Harvey. What a delightful epoch we have had in review: medicine no longer wholly empirical, but in large part an exact science, pain deadened or driven out of the surgical wards, mithridates and methusalem superseded by "elegant extracts," diet understood, the gaunt face of pestilence forbidden to appear in the cities where we dwell. What an excellent record Hartford has maintained in all this period! It is known throughout the land for its sagacious instruction of the deaf and dumb; for its wise treatment of the insane; for its discovery of anæsthesia; for its excellent hospital; for its advocacy of sound legislation and wise sanitary regulations; and for its learned, gifted, and skilful physicians, who in the fear of God have served their fellow-men.

UNIVERSITY LIBRARIES

AN ADDRESS AT THE OPENING OF THE SAGE LIBRARY
OF CORNELL UNIVERSITY

ITHACA, OCTOBER 7, 1891

The common world
Hath lessons no philosophy can spare;
The tree that ever spreads its leaves to heaven
Casts equal anchors 'neath the soil below.
With man it is as with the world he treads:
No little stone of yonder pebbled beach
Could cease to be, and this great rolling orb
Feel not its loss.

GALILEO, in Weir Mitchell's poem.

UNIVERSITY LIBRARIES

THERE are days in the lives of institutions, as well as of individuals, when we enter the realms of poetry and wander through the Elysian Fields. Such a day is this. As I passed this morning through these halls where silence is eloquent, I seemed to be walking in dreamland. Such arrangements for the care and use of books are ideal. In any building it is rare to find that commendable union of beauty and utility which your gifted architect has secured in this structure; it is most rare to see a library where, amid ornaments that allure and inspire the scholar without distracting his attention, the varied needs of various readers are adequately supplied. Here, as in many other libraries, are collected the priceless books of literature, history, philosophy, science, architecture, and art, from "The Book of the Dead," on papyrus, which faces us at the threshold, to the latest records of human thought; but here, as in few other places, such treasures may be enjoyed with abundant light, in an equable temperature, in the atmosphere of repose, with

learned and ready teachers near at hand, and with opportunities to enter those glorified cells of the cloister which we call the seminaries of knowledge. In the name of American scholars far away, I join with you in thanking your great benefactor, Mr. Sage, in thanking his generous ally, President White, and in thanking the authorities of Cornell University, for the example that is here set for American colleges to follow.

Such are the thoughts awakened in this place and at this moment; but I am here not to talk of your own treasures. It is rather my privilege to bring before you the thoughts that were suggested at a distance by a knowledge of this remarkable gift.

I BEGAN the preparation of this address in one of the shrines of American education, namely, Stratford, Connecticut, in the library of Samuel Johnson, first president of the first college established in the province of New York. With his books are those of his illustrious son, William Samuel Johnson, second president of the same college, now called Columbia. Here hang their portraits and those of their distinguished kindred. Here are original letters received from famous Englishmen and Americans of colonial days. The library is "stratified." Each owner has added to his inheritance, and the deposits, like fossils, reveal the life-histories of several generations. Here, for example, is a copy of Viner's "Abridgment of English Law," brought home in saddle-bags from New York, volume after volume, by a promising youth who

was destined to become one of the authors of the Constitution of the United States. Here are two folio volumes of Johnson's dictionary, sent to his New England correspondent by the great lexicographer, unconscious of the coming days when three New-Englanders, Webster, Worcester, and Whitney, would recast and enlarge his great dictionary.

Every book, every portrait, every paper, has its story. But none are so suggestive to me as those of Bishop Berkeley. I take down his own writings; I read the record of his life in Newport, and the narrative, well told by Dr. Beardsley, of the intimate relations between the author of "Alciphron" and his friend in Stratford; and I am reminded that, when the disheartened idealist was about to return to the Old World, Samuel Johnson visited him at Whitehall and made a suggestion which soon bore fruit tenfold, a hundredfold, a thousandfold,—who shall say? He proposed to Berkeley to send some books to the college in New Haven, and by and by they came. Rector Clap said it was the choicest collection which had ever been imported into this country at one time. It gave dignity at once to the institution at New Haven. It brought before the students and instructors perhaps a thousand well-chosen volumes, many of them folios, by classical authors, theologians, philosophers, and historians. It became the magnet to which students were attracted. Other gifts were drawn to it, and now a native of the very town in which Johnson was born[1] has provided for the books of Berkeley, and

[1] Mr. S. B. Chittenden, a native of Guilford, Connecticut.

for all subsequent accessions at Yale, a building which is remarkable for dignity, convenience, and the beauty of adaptation.

Berkeley's gift was an epoch in the history of American libraries, but it was not the dayspring, for, long before, John Harvard had bestowed his books on the college that bears his name. The founders of Yale took from their own shelves the books which constituted the original property of the college. A little later Jeremiah Dummer sent to Connecticut many valuable works contributed by Englishmen, among whom were Sir Isaac Newton and Sir Richard Steele. Nevertheless the collection that came from Bishop Berkeley was so large, so timely, and so choice, and, moreover, was given so cordially by a churchman to Puritans, that it is right for us, on this memorable day, to pause and pay our reverence to the name of that rare man, possessed of "every virtue under heaven." Has not the spirit of Berkeley remained in the New World he loved so well? Has it not descended upon the founder of this library, who likewise believes in the union of religion and learning, and who does what he can for the promotion of both knowledge and faith?

These historical allusions may be carried too far; yet if Bishop Berkeley is borne in mind, Dr. Franklin must not be forgotten, for he was engaged in 1731, the year when Johnson paid a parting visit to Berkeley, in founding a library in Philadelphia, to which, some years later, James Logan made his memorable additions. The examples of Berkeley

and Franklin are an inheritance better than great riches. Nothing which they proposed could be narrow, or provincial, or sectarian, for they were men of broad views as well as of generous impulses. One was a bishop, the other a statesman; one an idealist, the other thoroughly practical: both were philosophers and philanthropists who deserve to be remembered in every library of this land.

Even with the aid of these generous sponsors, the infant libraries of this country grew up very slowly. A century passed after Berkeley's gift before they reached maturity. It was not until 1831 that the potent influence of Anthony Panizzi was brought to bear upon the arrangement and administration of the British Museum. I quite agree with the learned librarian of Cambridge,[1] who said to me, not many days ago, with reference to the wonderful advances of the last half-century in bibliothecal management, "The modern impulse is due to Panizzi." This great man was more than a public functionary, more than a bibliographer, more than an antiquary, more than the keeper of printed books. Other foreigners in England have won renown, like Bunsen in diplomacy and archæology, Max Müller in philology, Rossetti in literature; and in any such pursuit Panizzi might have gained distinction. If he chose a career of less note, he so exalted that calling by his learning, wisdom, administrative power, and regard for public interest as to make it an honor to belong to the librarians' gild, to the school of Panizzi. Three centuries

[1] The late Dr. Justin Winsor.

hence his name will be recalled as Frenchmen now recall the name of Jacques de Thou, the learned historian who, three centuries ago, was placed by Henry IV over the royal library, and who transformed it into the National Library, now one of the greatest glories of Paris and of France.

But I must not be diverted from what I had to say in respect to the modern advancement of American libraries. When Professor Kingsley went to Europe in 1845 to buy books for the library of Yale, that collection numbered thirty-four thousand volumes. Harvard was better off, for it counted sixty-one thousand volumes, and was supplemented by the neighboring Athenæum in Boston. At that time the collections of other colleges were even less significant. Any one who is curious as to such statistics may find them carefully arranged in the American almanacs of the period referred to.

Our modern era begins with the establishment of the Boston Public Library—*anno Bibliothecæ Bostoniensis conditæ.* Its influence upon the country may be compared with the opening of the Central Park in New York, foremost of many public pleasure-grounds; with the building of Trinity Church in Boston, the emancipation of American architecture; and with the foundation of Cornell University, the pioneer in many college improvements. It was a fortunate misfortune that removed Professor Charles C. Jewett from the Smithsonian Institution and made him the head of the Boston Public Library. He was not more learned, nor more devoted, nor more wise than Dr. Cogswell, then engaged on the

foundations of the Astor Library; he was not more sagacious or practical than Mr. Herrick of New Haven, an ingenious master of details; but he was fortunate in the environment of Boston. Public opinion in that city demanded such a library as Professor Jewett had conceived, free, large, well catalogued, adapted at once to the public and to the scholar, dependent partly on the civic chest, partly upon the private purse, fitted to furnish entertainment and pleasure to the weary workman, and fitted to inspire and satisfy the most gifted writer. The Harvard library was accessible to the college, and the Boston Athenæum to its shareholders, and the Mercantile Library to its subscribers; but the public called for something larger, freer, better, "open to all," like the schools of which Boston has ever been proud. Everett, Ticknor, and many more of those whom Webster called "the solid men of Boston," became trustees and benefactors of the new undertaking.

The spirit of this library did not depart when the spirit of Jewett was called upward. Justin Winsor carried forward in a noble way the work that had been so well begun, and his colleagues and successors, librarians and trustees, have advanced the library to a very high degree of perfection. When it is transplanted, as it soon will be, to the magnificent building on the Back Bay, near the Museum of Fine Arts, the Massachusetts Institute of Technology, the Museum of Natural History, and the Medical School of Harvard University, the world will see distinctly what an American city can do, in

the course of thirty years, for the delight, the instruction, the elevation, and the cultivation of the people. There are times when we lament with good reason the degeneracy of city government and grow indignant at the triumph of unworthy men and unworthy measures, and when we are righteously impatient for reforms so needed and yet so slow to come; but we cannot despair of the Republic if we recall what a single generation of united citizens has accomplished in Boston, or if we look at three noble foundations in and near the Central Park of New York, or if we turn to Chicago, coming to the front with two libraries richly endowed, a buoyant university, and a promised exhibition of the progress of the liberal arts and sciences.

I will not venture to say which of the new library buildings of this country will prove to be the best. Each may be best in its own place, for its own purposes. Some of the less famous structures, like the Rindge Library at Cambridge, the Buffalo Public Library, the Worcester Public Library, are doubtless as good as the greater structures in New York, Boston, New Haven, Baltimore, Washington, Philadelphia, Ann Arbor, Milwaukee, and Chicago.

In lighting, heating, airing, and shelving, the new buildings are admirable; many of them, also, in exterior aspect. Copies of Greek temples, like the Rush Library of Philadelphia, and suggestions of Gothic chapels, like Gore Hall and the old library of Yale College (which were built half a century ago), are no longer in demand—a satisfactory change,

due in part to the able architects who have been engaged during the last ten or fifteen years in library construction, and in part to the experienced criticism and counsel of librarians like Dr. Poole. In the preparation and publication of catalogues the work of Jewett, Ezra Abbot, Poole, Winsor, Spofford, Cutter, Uhler, and others has left but little room for suggestions or improvements, although rumors come from San Francisco that great economies are still in prospect, especially for the printed catalogue. Facile administration has been secured by numerous convenient and inexpensive devices suggested by Dewey and his collaborators. The promptness with which any book among a hundred thousand may be identified and summoned, as if it were touched by an electric wire, is an unfailing surprise to those who are wont to spend hours in their own dens looking for some long-lost friend, and an unfailing gratification to every busy student. Mr. Winsor has invented the mechanical devices by which any book among ten millions may be brought in three or four minutes to the table where it is wanted, and it is reported that the devices will be introduced in the new library of Congress. The time during which public libraries may be visited has been greatly extended. Vacations have been reduced to a minimum. Many large collections are opened until late in the evening, and with the spread of electric lights, like those of Columbia College, the usage will grow. In the building where we are assembled, not only electric lighting but also the automatic regulation of the temperature

has been introduced. Some are open on Sundays, harbingers of the good time coming when, on the day consecrated to rest and quiet, those who would listen to the great thinkers of ancient and modern times shall not be debarred from the halls where living and departed worthies hold silent converse with inquiring minds. The office of a principal librarian is recognized as so dignified and important as to call for the services of scholars, varied and exact in learning, whose skill in collecting books is equaled by their skill in the diffusion of knowledge. Numerous assistants are essential. The art of index-making has been greatly developed and put into practice, thanks partly to the persistence of Dr. Allibone, who inclosed in his letters to literary men exhortations and appeals, and partly to the very great utility of Poole's indexes to periodical literature. The most recent illustration of this art is among the best, an index (in ninety finely printed pages) to the prose writings of Lowell, prepared by a librarian whose name I will not pronounce, lest I should violate his confidence or offend his modesty. The prompt acquisition of books, especially from foreign lands, is no longer a luxury like the importation of spices and gems; it is a necessity if American scholars are to keep in touch with the pulsations of humanity. All this requires a great deal of money. Fortunately, rich and generous men are not wanting. A favorite mode of bestowing wealth is the establishment of a library. Witness the noble gifts of the Astors, of Bates, Peabody, Rush, Lenox, Tilden, Newbury,

Crerar, Chittenden, and of many more. Those I have named are all departed founders. Among those who are living, the highest meed of admiration and gratitude is due to Henry W. Sage, the noble benefactor of Cornell University, whose magnificent gifts we celebrate this day.

Yet we must not suppose that our public libraries are perfect. There is much to be done, everywhere, even in those which are best managed, before the ideal of Panizzi is reached, which he once expressed in some such language as this: "I would have a public library so complete that a scholar, however rich, will find it a more convenient working-place than his own study, however well equipped."

Printed books—not to speak of newspapers, hand-bills, fly-leaves, and other ephemera—increase so fast that it would be unreasonable, if it were possible, to bring them all under one roof. Even for the publications of a single country it may be enough if there are one or two storehouses, like the library of Congress, the British Museum, the National Library of Paris, and the like, where completeness is the aim. Among other libraries some principle of differentiation must be worked out. In a large city this is not difficult.

Let me give you an example from the city of Baltimore, partly because I am more familiar with it, partly because of certain unique advantages it possesses. In the Peabody Institute may be found a modern, well-chosen, well-housed, well-arranged, and well-catalogued collection of more than one hundred thousand volumes, the books of which

(with a few exceptions) are retained within four walls, where any inquirer may find them. Not far away is the library of the Johns Hopkins University, arranged on the opposite principle, under ten roofs, and in even more compartments, so that the teachers and students of any branch may have at hand in the seminary or laboratory the books most important for the prosecution of that study. The Assyrian texts which delight one group of scholars do not embarrass the chemist, whose journals do not weigh down the shelves devoted to classical literature. Crelle's "Journal of Mathematics" is precious in the sight of another group of students, to whom the story of "Aucassin et Nicolette" suggests no attractions. Near these scholarly foundations is a free, public, and popular library, the gift of Enoch Pratt, with five distant branches. Most of the Pratt books are for circulation, and every one who wishes, rich or poor, may take home his volume. Around these central institutions are special libraries, under different control, for law, medicine, and theology. There is also a large historical library and a society library, the New Mercantile, where the subscribers have free access to the bookshelves. Thus, within a circle whose radius is a third of a mile, over three hundred thousand books are accessible to any student. Few cities in this country supply so well the wants of every class. The principle of differentiation works admirably, because each foundation considers the needs of its own clients, and supplies them as far as possible, and all are thus satisfied.

In the conduct of a single library—the only one of a place—the same principle may, in part at least, be made efficient. All books are not of equal value, and the same book varies in value, not only at different times, but also in different places. A volume may have its chronological and geographical value. That which is precious to-day was at one time valueless, or it would not have disappeared, like the fragments of the "Antiope" of Euripides, lately found by Mr. Petrie in a mass of waste paper. That which is of slight value to-day may become so rare as to be priceless four centuries hence, as are now the original printed letters of Columbus. Books that a single writer may wish to consult but once in a lifetime, though as worthless as brown paper to all but him, may be to him inestimable. Books that have slumbered for many decades suddenly awake from their lethargy and become living, perhaps at the touch of a discerning critic who calls them from the tombs, or perhaps at the occurrence of some unexpected event which excites the public curiosity, as happened in the case of the "Partisan Leader," which was revivified in the beginning of the civil war. The technical treatises, the nuggets of Americana, the first editions of famous authors, the dissertations of doctors of philosophy, have their value when in place; out of place, they may be like the straw from which wheat has been threshed. It is not safe for a librarian to destroy any book, lest it should presently be in demand. What then can keep the shelves from encumbrance? Only constant elimination, convenient storage,

frequent rearrangement. The books less wanted must be stacked away, half a mile away if you please, and the books most valued must be brought forward. Constant readjustments are essential to the healthy vitality of a library. This is troublesome, costly, difficult. But public libraries are troublesome, costly, hard to administer. As in a garden, weed the flower-beds every season; but remember that weeds are flowers out of place. The grass which is welcomed on the lawn may be spurned from the garden; that which spoils the strawberry-patch looks well upon the hedge-row. So let every library, like every plantation, be suitably divided; here grow fruits, here blossoms, here vegetables, here trees, and, yes, here also mushrooms. But heed the cautions of "My Summer in a Garden," and beware of too much "pusley." A library is valued, not by the numbers it contains, but by its adaptation to the wants of its clients. "I would as soon tell you how many tons the Astor Library weighs, as how many volumes it contains," said its first librarian, the learned Dr. Cogswell. Twenty thousand volumes well chosen and well arranged are worth more than ten times that number hurriedly amassed and ill assorted. The principle of a compositor's case in a printing-office directly applies to a library. That which is constantly in demand, like the letters *e* and *a*, must be at the fingers' end; that which is rarely wanted, like a caret, or some other unusual mark of punctuation, may be placed at arm's-length.

The task of a librarian is not half done when the

books are collected and conveniently arranged. They must be exhibited; that is, they must be brought to the attention of those who resort to the library, even if they know not what they want. Every scholar, every author of a great book, at least of every great book that involves research, is under obligations to the bibliographers. Look at the prefaces of Prescott, Sparks, Palfrey, and many other writers in the neighborhood of Boston, and see their acknowledgments to Charles Folsom. But such indebtedness is not always acknowledged. I suppose that, when the oracles of Apollo were revealed at Delphi, the priestesses did not always receive the recognition that might have been agreeable, but they were satisfied because the shrine was held in reverence; the more it became a resort for the wise and the powerful, the more the guardians were pleased. So modern librarians, like ancient prophets, reveal what is hidden and interpret what is obscure, preferring usefulness to fame. What is true of advanced scholars is likewise true of beginners. Every young person, every merchant's clerk, every aspiring mechanic, every college student, every candidate for professional distinction, needs to be told what books to read and what to eschew. Capital guides may indeed be found in print, like the handbook of historical literature prepared by President Adams, like the guide to English history by Gardiner and Mullinger, like Sonnenschein, Sargent and Whitelaw, Acland, and other kindred handbooks; admirable counsels are given by Frederic Harrison and Sir John Lubbock.

Still, the best of such guides are not like personal friends, wise, friendly, and sympathetic. I am fond of quoting to young men a remark of Grant Duff, to the effect that if we would read, see, and know the best that the world contains, we must always be warned against the second-best. But the best for one reader may be worse than useless for another. It is for the librarian to make the personal equation. He will not offer "Sordello" to one who wants an introduction to Browning, for he will remember Carlyle's saying that his wife read the volume through without discovering whether Sordello was a man, a city, or a book; nor will he give Pertz's "Monumenta" to the beginner in German history, nor Newton's "Principia" to one who asks for a simple statement of the law of gravitation. He will not yet bring out the Oxford dictionary to a reader who is interested in words beginning with F, nor will he refer to "the biggest book in the world," the reports of the British Patent Office, for a compact account of the steam-engine. He will not suggest "Rollo in Europe" to the prospective tourist if Baedeker is within reach, nor supply a board of agriculture with twelve copies of Miss Edgeworth on "Irish Bulls."[1] I might name librarians who are masters of the art of adaptation, born to be teachers, delighting to bring the right book to the right person at the right time. There are two towns in New England where the public libraries, not very large and not very well endowed, are centers of light to all the community. Here

[1] See the memoir of Panizzi.

come the school-teachers and their pupils, the preachers and the editors, the physicians and the lawyers, the inventors and the professors, the tired and sick seeking refreshment, the strong and hearty renewing their strength, and none are sent empty away. Each is sure that he has found the best for his purposes that the library contains. Worcester owes a great debt to Samuel S. Green; Providence, to William E. Foster. It was Green who said, in 1876, "There are few pleasures comparable to that of associating continually with curious and vigorous young minds, and of aiding them in realizing their ideals." I have known, on the other hand, libraries where a book off the shelves was regarded as a book out of place, where the librarians were indeed the keepers of the books, where every inquiry for a rare or costly volume was received by the officer in charge with as much reserve as if his private cash-book had been called for. The dictum of Justin Winsor is worthy to be placed by the side of Panizzi's dictum: "A book is never so useful as when it is in use."

In these days, when the cry for university extension is popular, it may be well to consider whether the influence of libraries cannot be extended by arrangements which will increase their efficiency. Let it be understood that at certain times an intelligent and well-read person, in the service of the library, is free from all other duties and is ready to give counsel about books to all who question him. Let it be a part of his business to study the wants of those who frequent that library. Let him have

at his elbow the best catalogues, indexes, and criticisms. Let him be trained to such habits that he can readily find what he wants in a library, even when for the first time his attention is called to a subject. Let him be of a kindly disposition, patient with the uninformed, ready to catch the meaning of inquirers who have only imperfect modes of indicating their own wants; let his sympathies be broad, his intellect versatile, his knowledge comprehensive: he will do as much for the cultivation of the community as the editor of a newspaper, as the head of a school, as the pastor of a church—perhaps I might say as much as all three. Such persons are often found in public institutions. They ought to be considered as indispensable members of the library staff, the ushers of good books, the mediators between those who write and those who read. In these remarks I had chiefly in mind the popular library. In learned libraries, like those of colleges and universities, and in those so richly endowed that they are attractive to learned men, the principal librarian or superintendent should be a man of wide knowledge. If it is not necessary for him to know as many languages as Mezzofanti, he should at least command Greek and Latin, French and German. He should love science as well as literature. He should survey with an eagle's eye the vast fields of human activity, and discern with prophetic instinct what books will soon be wanted. He should watch for opportunities as do merchants to purchase that which rarely comes into the market. He should be skilful in arranging

the treasures that he guards, so that they will be most helpful and suggestive to the investigator. The librarian's office should rank with that of the professor. He will be the better administrator if he cultivates his own special branch of study, for thus he will have a sympathetic relation with other investigators, and he will be the better investigator if he is also a teacher. Erudition should be the characteristic of his mind; beneficence, of his heart. I wish it were the established custom to seek out such men and place them in charge of our libraries. Some such already hold conspicuous stations. Their names are familiar to all the scholars of the land. But we need more such men. The profession of librarian should be distinctly recognized. Men and women should be encouraged to enter it, should be trained to discharge its duties, and should be rewarded, promoted, and honored in proportion to the services they render. The American Library Association is an important agency for suggesting, upholding, and diffusing wise views upon library management. Its purposes and methods deserve wide commendation.

It is hardly necessary to say that one of the functions of a library is the preservation of the past experiences of our race; but in these days, when the latest intelligence is most welcome, and is secured for us, at enormous outlays, from every part of the world by the newspaper press, with such skill and promptness as former generations did not even imagine, it is well to be reminded by great libraries that wisdom did not begin with the

Renaissance, and that knowledge was recorded long before the invention of printing. The revival of learning did indeed infuse into the modern world a love of the study of antiquity, which has been again revivified during the last few years; and the progress of the graphic arts, especially photography and typography, has enabled the scholar to read the exact facsimiles of records which were long buried and hidden, and which, if brought to light at an earlier day, might have been neglected as inexplicable or illegible. The discovery of a portion of Aristotle's "Politics" has lately excited the scholars of the world as if the pot of gold had been found at the foot of the rainbow, and the text thereof may be brought before a class by Professor Wheeler in Ithaca as well as by Mr. Kenyon in London, because the British Museum has given to the world an accurate reproduction made by the unerring style of Helios. The "Teaching of the Twelve Apostles," one of the earliest books of post-apostolic times, preserved in the library of the Holy Sepulcher at Jerusalem, has been printed with photographic truth in Baltimore. A professor of Haverford College visited the convent of St. Catherine at Mount Sinai, long after Tischendorf, and brought away a transcript of a Syriac Aristides, containing a distinct allusion to a written gospel, which Harnack calls a brilliant discovery.[1] Fragments of Greek authors, recently found upon

[1] For this allusion and two of the following, see the address of Professor Jebb as president of the Society for Promoting Hellenic Studies, June, 1891.

papyri, have caused in the world of scholars, says Professor Jebb, such a ripple of excitement as might have been felt on the discovery of a manuscript in the days of Petrarch. These finds are not mere curios. Isolated, they might be insignificant; in their relations, they are of great importance. It is the nineteenth century that has restored Egypt to her place in ancient history, by the interpretation of her hieroglyphics; that has exhumed Assyrian and Babylonian literature and translated the cuneiform annals of ancient Mesopotamia; that has revealed the site of Troy, and of Tiryns, older than Troy; that has explored Phenicia and Carthage, and has come upon signs, as Mr. Petrie intimates, that a European civilization little indebted to Asiatic lands may have arisen before 2000 B. C.

All this experience great libraries perpetuate for our instruction and delight. So long as curiosity dwells in the mind of man—and when curiosity dies man will be but a beast of burden—so long will he inquire into the origin of man, his habits, his laws, his religions, his institutions, his failures, his endeavors. Our libraries, therefore, gathering up, handing down, arranging, interpreting, and making public the lessons of the past, supply one of the most constant and one of the noblest demands of civilization. It is not necessary to determine where the functions of the archæologist end, or those of the librarian begin. Both are the interpreters of human experience, the conservators of human records. The fly-leaf, the pamphlet, the

book, the photograph, the palimpsest, the parchment, the inscription upon marble or bronze, the coin, the medal, the papyrus, and the wedge-lettered cylinder—these are the journals, the annals, the memorials of our race. Bring them together, founders of libraries; interpret them, professors of languages; give us their lessons, teachers of history: that the days to come may be better than the days of old, that the errors of science, of politics, and of religion may not be repeated, that coming generations, standing on the shoulders of their forebears, may see farther and act more wisely than those who have gone before.

A library, however, is not merely a magazine or storehouse. It is, rather, an organism which has life, which tends to self-preservation, growth, and reproduction. It is never the same, not because its elements are shaken up like the beads of a kaleidoscope, but because they grow like the cells of a honeycomb. Constant readjustment of the books that are in demand, and no interference with the reader's convenience, may be called the librarian's paradox. The problem was solved by Panizzi, on a great scale, when the new rooms of the British Museum were arranged; by Uhler, on a lesser scale, when the Peabody Institute was enlarged. It must be met by every librarian who tries to keep in proximity the important books of any subject, while he sees inviting accessions constantly seeking places.

A noble library is like a noble organ. Its value depends upon the player. Not everybody who can blow the fife or beat the drum can elicit an

organ's harmony. Not everybody who enjoys the music can play a single strain. Not every one who can build the instrument, or who understands the mysterious mechanism of keys and stops and pedals, has the power of melodious expression. But when a master sits at the keyboard, celestial harmonies are heard.

Inspiration is one of the chief functions of a library. In these days of rapid acquisitions, quick demand for the latest publications, and impatience if a book cannot at once be produced, our libraries are in danger of losing one of their most precious qualities—quiet suggestiveness. In every library there should be places of repose where the student may have access to the shelves, and, without revealing to any other human mind the operations of his own, may take down, at his own will, and hold for a minute or a day, whatever books he pleases. Carlyle was refused such a privilege at the British Museum—and what a blunder! Mark Pattison might have consoled him with the like experience of Casaubon,—scholarly friend of Henry IV of France and of James I of England,—who was "perpetually thwarted in his natural curiosity to explore the treasures of the royal library in Paris by the morose temper of the custodian—too ignorant to use the library himself, too jealous to allow others to use it." Of Gosselin, who thus thwarted Casaubon, it is recorded that in the imbecility of extreme old age he still clutched his treasures with a desperate grip.[1]

The principal librarian, or, if not the librarian,

[1] Pattison's "Casaubon."

then the trustees of every large collection, should have the discretion to admit to the shelves those who are qualified in their morals as well as in their understandings to enjoy such privileges. The easy access of the public to twenty or thirty thousand volumes like those which surround the walls of the central reading-room of the British Museum is important, but it is likewise important that men like Casaubon, men like Carlyle, men like Macaulay, should be welcome to the dark penetralia. Wherever they go they will bring forth honey.

Repose in a library will become one of the lost illusions of the scholar, if our librarians, with over-readiness to answer the inquiries of the asker of "twenty questions," are not even more alert to recognize and encourage the modest, unobtrusive lover of good books. The reader of leisure is as worthy of attention as the hurried caller. He is more likely to produce the fruits of quiet reflection and accurate scholarship. If it be said that Lowell is one of the last great writers who have given distinction to Boston during the middle of this century, it may be worth while to inquire whether the gentle, inspiring, peaceful influences of literary quietism, under which he and his contemporaries, Emerson, Longfellow, Ticknor, Hawthorne, Motley, and Prescott, and their kinsmen of the pen, grew up, are known to this generation, and whether, in our cultivation of other fine arts, we are not forgetting the noble art of leisure. Mr. Lowell is right in saying that a leisure class without a definite object in life and without generous

University Libraries

aims is a bane rather than a blessing; but it is the writer of the couplets on yonder bell, "that calls as fly the irrevocable hours," who has taught in his life the uses of leisure, and in his verse

> The pleasures of retreat,
> Safe from the crowd and cloistered from the street.

THE TEACHERS COLLEGE OF COLUMBIA UNIVERSITY

REMARKS AT THE OPENING OF THE NEW BUILDINGS

THE TEACHERS COLLEGE OF COLUMBIA UNIVERSITY

NEW YORK is an example to all this land—a colossal object-lesson. It is in itself a sort of Teachers College, where other cities may learn both what to do and what not to do. It suffers a bad municipal organization for years, then overturns it in a day with the battery of the ten commandments. Other cities may follow or neglect the lessons, but are sure to watch, weigh, and judge what happens on the island of Manhattan. The Central Park is opened—similar parks appear in Boston and San Francisco; museums devoted to the works of nature and of art are established—Washington and Chicago begin the like; Columbia unites the institutions of higher education in a federative union—Baltimore longs to do the same. Here and now, the unfolding of a new idea is celebrated—an idea not absolutely new, but new in its environment and possibilities. The leaders of education in other cities, in surprise and delight, will note, praise, emulate the suggestions here

embodied, the generosity with which they have been supported, the enthusiasm which has governed their development.

Consider for a moment the philosophy of the effort that has resulted in this foundation. M. Taine (in one of the essays reprinted in a posthumous volume) calls attention to a study of architecture in the light of philosophy, by M. Boutmy, chief of the École Libre in Paris. This excellent critic takes the Parthenon as a type of Greek temples, and shows how such general causes as geography, history, and the intellectual characteristics of a race, in connection with temporary circumstances, have determined, assembled, and put in their proper places all the parts of that noble edifice which we study in ruins, or which, reconstructed in detail, we admire in a model in the Metropolitan Museum. "We place," says M. Boutmy, "this typical building of Greek architecture in the middle of a tableau of general civilization, in the full light of a psychology of the time and of the race."

Now, if one of our countrymen should endeavor, in this spirit, to select and examine that which is most characteristic of American culture, he could not point to a Parthenon, nor a Notre Dame, nor a temple of Luxor. There is no transcendent American drama or epic. No Michelangelo, no Rembrandt, no Titian has appeared in this country. For centuries our forces have been expended upon the development of a continent, the preparation of an imperial domain to be the home of a hundred

million people, governed by a democracy. As the fifth century begins, Americans are spontaneously devoting their energies to education,—to the maintenance of schools, colleges, parks, museums, libraries, surveys, laboratories, observatories,—and it seems highly probable that the type of American civilization will be found in the union, in New York or some other city, of all possible agencies for the enlightenment and instruction of the people. There will be, no doubt, many independent organizations acting in federal alliance more or less close. Dissimilar parts will make an harmonious whole. Our Parthenon will be a university. Our typical achievement will be a system of popular instruction, such as the world has never yet seen, based upon common schools, and terminating in varied, complex, and beautiful opportunities for the acquisition and advancement of knowledge in every kingdom of nature, in every domain of man. This will constitute an acropolis—at once a shrine, an ornament, and a defense.

To the group of institutions destined to make the University of Columbia College in the city of New York, the latest accession is this Teachers College, well worth our study apart from its relations to the colleges and schools with which it is associated.

It began its work without an adequate endowment; it soon outgrew the walls by which it was sheltered; friends rallied to its support; its credit was established; its influence grew with its opportunities; and consequently, after eight years, we behold

these admirable structures, and this faculty of fifty teachers, provided with superior advantages for the guidance of more than six hundred scholars. Why this success? Because the Teachers College stood for a germinal idea. And what was this idea? If my outside view is correct, the idea, the life-giving thought of this growing organism, was simply this: teachers of all grades must be trained; their training must be in modern methods; and these methods must train their hands as well as their eyes. "Redecraft" and "handcraft" have been here united. A college has been built on whose walls might well be inscribed the words addressed to ancient Corinth: "The eye cannot say unto the hand, I have no need of thee."

How has this idea of the training of teachers in manual and in mental arts been unfolded? Not by an instantaneous impulse, not as the result of one great gift, not by the decree of a sovereign state, not by popular agitation, not by a break from tradition, but by the principles of evolution. The training-college is the work of private individuals, voluntarily associated. Some gave thought, some gave toil, some gave coin, some gave sympathy, some gave counsel, all gave faith. Women have been among its chief supporters, its most determined friends. They have been quick to perceive the defects and errors and shortcomings of ordinary schools and colleges. They have had the sagacity to indicate by what agencies improvements could be brought about. Wealth, always ready to meet want, has been ready to help

those who were clear in their purposes, determined in their action, and in obvious need.

If my analysis is correct, there are two elements in the idea of this foundation. First, the training of teachers of every grade for the work of their vocation, whether they be called to the kindergarten, the private school, the public school, the industrial school, the art school, the college, or to the supervision of schools. Normal schools have long been maintained in this country; professorships of pedagogy have been recently established. But there is nowhere such a training-school for teachers as here exists. In its amplitude this is a positive contribution to American instruction. It breathes the spirit of the times, which demands special preparation for specific pursuits. Modern civilization is so intricate, the agencies which promote intellectual and material well-being are so delicate, so varied, and so complex, that specialization, and especially specialization on the basis of general culture, is everywhere necessary. Here it is not the chief purpose to train architects, or engineers, or mechanics, or chemists, or investigators, but teachers, those whose business for life it will be to awaken, develop, inspire, and inform the youthful minds submitted to their charge. The second element in the idea of this foundation is training in handcraft. This also comes from the necessities of modern life. Since the introduction of laboratory instruction in chemistry, similar methods have been extended to almost every department of knowledge

—yes, even to languages and history. These methods have not only produced a quiet revolution in colleges and universities throughout the world; they have originated or have quickened technical schools, trade schools, industrial schools, manual-labor schools, kindergartens, manifold in purpose and in plan, but governed by one law: "The eye cannot say unto the hand, I have no need of thee."

It was not so in earlier centuries. Look backward. Remember the toil of the Benedictine monks, in the silent scriptorium of a medieval convent, that they might perpetuate and disseminate in manuscript the sacred and the classical books; recall the labors of scholars in the cloisters, from the days of Abélard to Erasmus, from Erasmus to Pusey, to interpret the written text. Follow the art of printing, from the days of Faust and Gutenberg to those of Thomas Carlyle, who boldly asserted (in words often quoted) that "the true university in these days is a collection of books." Behold, by all this, the reign of myopia has been established. What spectacles we and our children are! Verily, the art of seeing things as they are has passed into decay—yes, into decrepitude and danger of death. Let me give one striking illustration. A distinguished anatomist, whose daily duty is to train educated classes of aspiring physicians (every one of them a college graduate) in the knowledge of the human body, told me, a few days ago, that his hardest task was to make the members of these classes see three dimensions of space. These medical students,

who must learn the topography of every human organ, are so used to the printed page, and especially to diagrams and other flat illustrations, that they cannot perceive solidity, nor comprehend structure, until their bad habits are broken up, their power of vision and of image-building recovered. Yet these students are the very elect, with tendencies, inborn and acquired, toward studies the beginning and the end of which is a study of the phenomena of nature. A few months' study of descriptive geometry, with a little practice at the carpenter's bench, would remedy their defects.

Let me give you another illustration. There are nearly seven million negroes in this country, the children of emancipation. Christian philanthropy and humane statesmanship have united to provide instruction for these people, a very large part of whom, from the nature of the case (whatever may be thought or wished), must live by the labor of their hands and arms. Now, how does the country proceed? It opens high schools and universities, offers courses in Greek and Latin, in theology and philosophy and the higher mathematics. Not everywhere. At Hampton and Tuskegee, and in some other places, exemplary industrial schools are maintained. But generally, when there is a desire to give instruction in manual labor under the influence of the Slater Fund or other agencies, the effort breaks down, or is so feeble that it commands no respect. And why? Because instruction in handcraft is con-

trary to tradition. Redecraft rules. The proper methods of manual training are not recognized; the qualified teachers cannot be found. So for years those who are interested in the education of the blacks have been groping in the dark. To this training-college for teachers the country now looks for methods, for plans, for instruments, and, above all, for teachers to be of service in the solution of a problem of national importance.

This demand for guidance is by no means restricted to the teachers of the negro. In almost every large city, at the present time, measures, more or less efficient, have been adopted for supplementing the literary or the book training of the common schools with manual instruction. President Hayes was, during the latter years of his life, the efficient advocate of such schools, and in Toledo, near his home, had a good example of what might be accomplished. I well remember with what intense interest this distinguished man, whose later years were given up to education and philanthropy, visited the Teachers College in University Place, Colonel Auchmuty's Trade Schools, the College of the City of New York, and one at least of the public schools where manual training is provided; and the lessons he learned here were repeated in the addresses which he gave in many cities of the West and South.

In this Teachers College, intelligent oversight, voluntarily assumed, intelligently exercised, persistently attentive, and liberally sustained, has already trained great numbers of persons as

teachers, and has enabled many others to perfect themselves in their work, all of whom go forth (if they bear the official certificates) trained in handcraft. As a consequence we see the influence of the school felt in the most distant parts of the country: an orphan asylum in a Southern State needs a teacher skilled in the manual arts, and finds her here; a great educational institution is founded with an endowment of a million dollars, and the guidance of its work in handcraft devolves upon a graduate of this training-college; a hospital with a training-school for nurses needs some one to give instruction in the art of cooking, and looks here for the instructor; an Australian visits the schools of Europe and America, in order to discover what is best for his own land, and singles out in his report the work of this college as exemplary. Beneath these phenomena there lies, as we have seen, a sound philosophy.

Let us, then, reach the conclusion. The world has come to recognize the educational value of the study of objects. Accurate measurements, not in one domain, but in many, not in two dimensions of space, but in three; close attention, aided by instruments of precision, the power of truthful delineation, comparison, verification, adaptation, are now acknowledged to be important in the training of the mind, whether regard be had to the development of personal character or the preparation of youth for practical life. When the habits of accuracy thus acquired are generally employed in common duties, the millennium will

be at hand, or we shall be dwelling in Utopia; at any rate, Truth will be established on her lawful throne.

But all this is to be accomplished without opposition to or indifference toward the study of letters and the use of books. They can never lose their power. Poetry, history, biography, the drama, essays, travels, philosophy, and the sacred books will forever engage, delight, and instruct the human intellect. Ancient civilization, its literature and art, were never so interesting as now, when the spade has been called to the aid of the pen. Egypt and Mesopotamia have given up their buried treasures; Olympia and Delphi are better known than they were to Pausanias. Yes, indeed, wherever we turn, we behold this day, not the warfare, but the marriage of handcraft and redecraft. "The eye cannot say unto the hand, I have no need of thee."

WASHINGTON AND LEE UNIVERSITY, LEXINGTON, VIRGINIA

REMARKS AT THE INAUGURATION OF THE HON. WILLIAM L. WILSON, LL.D., AS PRESIDENT

WASHINGTON AND LEE UNIVERSITY

I BRING to the State of Virginia a cordial salutation from the State of Maryland; to Washington and Lee, the congratulations and good wishes of institutions new and old, her elders and her juniors, on the other side of the Potomac. With you, we rejoice that, in beginning a second century, with the illustrious names that form your title you associate the name of one upon whom the plaudits of the present generation have been bestowed—a scholar, who brought into the forum the discipline and knowledge acquired by study; a statesman, who returns to academic life with experience and wisdom derived from public life; a scholar and statesman, whose rare ability has been concentrated, without a momentary halt, without partizan reward or financial gain or selfish anticipations, upon the advancement of those principles which were to him the highest interests of his countrymen.

When a new commander, in a critical period, takes his place at the head of a regiment of schol-

ars, in the sight of educated men and women assembled from afar, in the presence of recruits eager for the fray, it is natural for a veteran to recall the phrases of the camp, the watchwords, the mottoes, the cries, the notes of warning and of success, which, received from others, have inspired and strengthened him.

One of these notes I often repeat, because it is suggestive and venerable—the style by which the mother of universities was designated many centuries ago. That great organism whose influence extended from Paris to Oxford and St. Andrews, and from thence to our own Harvard, William and Mary, and Yale,—that great institution, famous for the eloquence of Abélard and the learning of Gerson,—was called a society of masters and of scholars. That defines a true university—*societas magistrorum et discipulorum.* Teachers, guides, authorities, there must be in a seat of learning, men of scholarship, genius, and of quickening powers, or it will not be influential, or even respectable. Learners, disciples, recipients, and candidates there must be, docile, faithful, and of talents, or it will not be fruitful. Such teachers and scholars are not bound together as task-masters and slaves, as jailers and captives, as scourges and drudges, but as associates, inquisitive, coöperative, and resolute, devoted to the formation of intellectual habits, the enjoyment of a literary heritage, the advancement of knowledge, and the reiteration of doctrines which lie at the foundation of church and state.

Washington and Lee University

When Plato introduces his dialogue on the Republic by a scene in the house of the aged Cephalus at the Piræus, where Socrates was professor, and the class was composed of Glaucon, Polemarchus, and others who had been attending a religious festival, he suggests a little university, without libraries and laboratories, it is true, but with a master whose words, as reported to us by Plato, have burned and shone through subsequent ages. Here may be traced the inspiration of Cicero, St. Augustine, and Sir Thomas More. Here, too, may be found that earliest treatise upon education, of which the writings of Milton and Locke, Rousseau, Jean Paul, and Goethe, are the legitimate descendants. Jowett, a modern Platonist with Socratic bias (from whom all these allusions are taken), speaking for himself, declares this truth of which all college men are conscious,—"the great charm of universities, which gives them such a hold on after life, is that they form a society in which mind is brought into contact with mind, and there is conversation, and enthusiasm for knowledge, and united help in study."

The true university does not depend upon "cloistered aisles" or a beautiful "campus," nor upon instruments of precision, nor upon examinations and degrees, but on the conference, face to face, of mind and mind. There is an old French *mot* (attributed to Buffon) which says of eloquence that it is the body which speaks to the body—*C'est le corps qui parle au corps;* but it is still more true that education is the action of one person upon

another. Books and journals are indispensable; laboratories, museums, and observatories are powerful auxiliaries; correspondence is not without utility; and the value of lectures cannot be questioned—certainly not by those who lately listened to the voice of Brunetière, heir to the traditions of Guizot, Villemain, and Cousin. Nevertheless, the lasting, telling, winning influences of a university depend upon the discipline which pupils derive from daily, familiar, oral intercourse with their masters. The eyes, the tone, the pause, the emphasis, the gesture, the searching Socratic question, the shaft of irony, and the salt of encouragement convey instruction far more rapidly than the typographical devices of dictionaries and text-books, capitals and italics, synopses and indexes, which a library provides. It is not the telescope nor the microscope which makes discoveries, but the eye and the hand that follow the lessons of other eyes and hands. The text, the manual, the code, the sacred books themselves, increase in potency under the timely and personal influences of an interpreter.

It was a little country college in eastern France where Pasteur's life was begun. It was a little country college at Metz where Tocqueville received that classical discipline which preceded his studies of American democracy. It was a little country college, away down East, which at one birth gave to American literature its most popular poet and its greatest master of English prose. It was a little country college in the Berkshire hills from

which America's foremost philologist came forth. It was the undeveloped little colleges of the day which contributed, to the formation of our Union, Washington, Adams, Jefferson, Hamilton, Madison, and Marshall. In a country law school, on a hilltop of Connecticut, John C. Calhoun and hosts of the leaders of the bar, in the early part of the century, received their training. It was Dartmouth which drew from Daniel Webster before the Supreme Court in Washington that familiar and pathetic passage: "It is, sir, as I have said, a small college, and yet there are those who love it."

If we now admit that a university does not depend upon numbers, whether of acres, buildings, books, students, or base-ball trophies, but on a few great men, unknown, perhaps, to the outer world, recognized, where known, as strong in understanding and behavior, we may well proceed to inquire why the scholars' gild should receive munificent support, why churches should collect such generous sums, States tax themselves for the promotion of learning, poor men and women deny themselves comforts to educate their nearest kin, and generous benefactors give their fortunes for the endowment of schools, colleges, and universities. Often as these questions have been asked since popes and emperors, as the leaders of the Renaissance, set the example, and since John of Baliol, William of Wykeham, and Cardinal Wolsey made the great benefactions which still enrich the University of Oxford—often as these questions

have been discussed, each institution in its turn, each president in succession, can give a fresh reason why now as well as then, here as well as there, by you as by them, wealth should be consecrated to the promotion of knowledge and the higher education of youth.

The answer is obvious. The progress of civilization has given to this age a vast amount of important experience, an infinitude of scientific discoveries prolific in usefulness, a complexity of social, jural, and international affairs, a diversity of pressing requirements, a possibility of rapid, innumerable, beneficial achievements universally serviceable, which call for strong men as expositors and interpreters, as discoverers and researchers; and every strong man must have strong adjuncts, and they must have manifold, expensive, and varied apparatus constantly renewed. The day has gone by when a shepherd boy with his sling can conquer an army by slaying one foe, though that boy be David and that foe Goliath. The University of Athens no longer flourishes in the dwelling-house of Cephalus or in the groves of Academus.

Claiming, therefore, a generous support from the public, let us, my brethren, on this public festival, repeat our creed:—

First, we cling to the love of letters, the *literæ humaniores*, the humanities of our scholastic glossary, the history, the philosophy, the poetry, which our race has inherited from the fathers.

Second, we believe in science and are indissolubly

united for the advancement and diffusion of every sort of knowledge.

Third, we look forward to the simplification of religious faith and the supremacy of those Christian doctrines which transcend denominations and sects.

Fourth, we are bound to study the functions of the state and the conditions of public prosperity, and to bring the experience and wisdom of the world to bear upon the political and social problems which occasion solicitude to every patriot.

These are our four watchwords—"letters," "science," "Christianity," and "politics."

Politics I named last because I wish to dwell upon the obligations of a university to the commonwealth.

Democracy has been established in America by the opportunities, experience, and legislation of more than a hundred years, and democracy in every European state is taking courage from our successes and warning from our errors. Our example, for better, for worse, is before the nations. Notes of dissatisfaction and of discontent with republican institutions are heard more frequently at home and abroad than they were in the early years of this century. Criticisms of the management of foreign and domestic affairs have been pointed and searching. False conceptions of the functions of government have become current. Heresies respecting the nature of money are prevalent. The Jingoes are loud and frequent in their cries. Municipal government is palsied. It

is even questionable whether legislation as now conducted is a real expression of the wishes of the people. With abundant resources and unquestioned honesty in administrative details, the general government, for want of proper legislation, was lately brought to the verge of bankruptcy. Discontent has been in the saddle, and anarchy has been lurking behind the hedges. All this is recent history.

In these anxious days there is a bright light. It is the energy, the honesty, and the intelligence of the educated young men of the country who are turning to politics. I well remember that, in the great campaign of 1896, a leading speaker took a very different view of the situation, and scoffed at the idea of going beyond the rank and file, the bone and sinew, for political instruction. But he did not represent the people in whose behalf he spoke. The people more and more are looking to fearless, independent, non-partizan leaders, to educated men who have become acquainted with the experience of other nations, made political science a study, and deduced from the mazes of public finance true monetary principles. Where can such men be found if not in colleges and universities, and in those they send forth to promote the public weal?

Institutions of learning are like the beacons and life-saving stations of the coast. They concentrate the knowledge of the past upon the perplexities of the present, propose relief to those in peril, proclaim the facts of history, and suggest the methods

of dealing with those facts, so that the people may add knowledge to their intelligence, and wisdom to their knowledge. The keeper of a lighthouse is not responsible for the fogs which hover about his beacon and the storms which fiercely howl; nor for the action of the pilots; nor for the charts, compasses, courses, or cargoes of the ships that are passing in the night; but he is the indicator of reefs and rocks. The greater the tempest the more essential it is that his light shall burn in serene clearness to guide the mariner into the haven of safety and peace.

Before I close, let me congratulate this university that its name perpetually presents to its students, as examples and incentives, ideals of lofty personal character. Both Washington and Lee became opponents of the government under which they had lived, but the one has received from the subjects of the crown, and the other has received from the defenders of the Union, abundant praise. The breath of slander never soiled their reputation, while the purity of their motives, the bravery of their hearts, and the nobility of their lives will never be forgotten as the story is told of their brilliant strategy, their patience in adversity, and their courage in the field. The words with which a citizen of Baltimore,[1] chief of staff to General Lee, facing a Northern assembly at the grave of the Union commander, bore testimony to the greatness of General Grant, should be familiar to every school-boy; and I trust that the day will

[1] Colonel Charles Marshall.

come when a Northern speaker before a Southern audience will extol with equal emphasis the virtues of one who sat in the "perilous seat," the Galahad of the Confederacy.

As successive generations go forth from Lexington, the home of Lee and Jackson, to engage in the battles of the Republic,—battles that will call for as much courage as if they were fought with fire and sword; battles for law, order, honesty, and good government,—let them exalt the characters that are here remembered, and be strong in the consciousness that they are sons of Washington and Lee.

Plato's commandment, made familiar by constant repetition, is this: "Let those that have lamps pass them on to others." For more than twenty years, Mr. President, I have carried in my hand a lamp thus lighted in Baltimore. The words of President Eliot, spoken in 1876, I repeat to you, that you in your turn may repeat them to others:

> It is a precious privilege that in your ordinary work you will have to do only with men of refinement and honor; it is a glad and animating sight to see successive ranks of young men pressing year by year into the battle of life, full of hope and courage, and each year better equipped for the strife; it is a privilege to serve society and the country by increasing the means of culture; but, above all, you will have the happiness of devoting yourself for life to a noble public work, without reserve or stint, or thought of self, looking for no advancement, hoping for nothing again.

HIGHER EDUCATION IN THE UNITED STATES

ADDRESS OF THE PRESIDENT OF THE INTERNATIONAL CONGRESS ON HIGHER EDUCATION, HELD IN CONNECTION WITH THE COLUMBIAN EXPOSITION

CHICAGO, 1893

HIGHER EDUCATION IN THE UNITED STATES

IT is fair to presume that an intelligent foreigner, like Professor von Holst, now one of our colleagues; Professor Bryce, the most philosophical observer of American society since De Tocqueville (not even excepting Francis Lieber); or Professor Levasseur, the accomplished member of the Institute of France, now visiting this country, if he were asked his impressions respecting the state of higher education in the United States of America, would reply that the public show an amount of interest in universities and colleges unequaled, and perhaps unapproached, in England, France, or Germany. If he were asked for particulars we might find that his impression was not wholly derived from the notices that appear in the public journals, nor from the increased attendance in our halls of learning, nor from frequented conferences like this, but from the readiness with which the people in many of the States tax themselves for the support of seminaries of learning,

and from the munificence with which private individuals contribute to the endowment of old and new foundations. Yet this friendly observer would doubtless add, if he felt at liberty to speak with candor, that American ideas in respect to higher education are undeveloped. The diversity of scope, methods, purposes, degrees, names, is confusing. No established churches exercise either legal or traditional control. No central, national authority has any right of superintendence, oversight, or inspection. Each separate State has its own organization. There is not even a consensus as to the province of the "State universities." For example, compare Michigan and New York. Where such institutions are established, other universities may flourish side by side. Academic titles have no significance unless the source is known from which they are derived. Anybody who chooses may call himself a "professor," and the only penalty that he incurs is the gentle rebuke of his neighbors. The word "university" has often been applied to institutions of the humblest character; for example, it was a title frequently bestowed upon the schools for the emancipated blacks established in the decade just following the civil war. Indeed, if the intelligent foreigner were to seek, either in our usages or in our educational literature, for the received idea of a university, he would often be amused. He would hardly know whether Lowell was in jest or earnest when he told Dr. Walker that "a university is a place where nothing useful is taught";

nor would he be quite sure what Garfield meant when he said, in substance, that "a log with Mark Hopkins at one end of it and a student at the other would be a seat of learning."

About fifty years ago, one of the most gifted and one of the most influential men produced in this country projected what might be called a university of his own. Naming several of his associates, Ralph Waldo Emerson said to a correspondent: "Do you not see that with one or two chosen persons we might make a puissant faculty and front the world, without charter, diploma, corporation, or steward? Do you not see that if such a thing were well and happily done for twenty or thirty students only, at first, it would anticipate by years the education of New England?" All this, from a European point of view, is abnormal, untraditional, and unconstitutional. It is hardly comprehensible by those who are only familiar with the ways of their own lands. They know the difficulties encountered in securing a charter for the Victoria University in England, or in establishing a teaching university in London; and the close restriction of the term "university" in France; and the orderly government and affiliations of the universities of Germany. Undoubtedly (the friendly observer might remind us) there is in this country much wasteful expenditure of force, much overlapping, much rivalry, much error that might be avoided, much misleading of the public, and even much injury to the rising generation.

With criticisms like these the leaders of higher education in this country would probably concur. In rejoinder, they might ask the intelligent observer from other lands to remember that the diversity which seems to him like confusion is almost an inevitable result of that local self-government upon which all our institutions depend. If our universities are suffering from excessive spontaneity, they are free from every form of intellectual despotism. Separate institutions may indeed be governed by the enactments of a legislature or the regulations of a religious denomination, but, as a whole, the higher education of this country is absolutely free from political and ecclesiastical control. Any attempt to regulate the universities by forces outside of themselves would certainly be thwarted—could hardly be thought of. Americans prefer the lesser to the greater evil. At the same time it is unfortunate that there should be so much reduplication. Every one knows to what extent in his own neighborhood this manifolding process has gone on. It is like the paralleling of railroads, where the doctrine seems to be, "If a line is doing a good work, duplicate it, even if you ruin it, so as to get a share of the profits." Many years ago, President White of Cornell University, in an address which ought to be kept in constant circulation, urged that there should be concentration upon a few strong universities, not multiplication of feeble projects. Still, the contrary tendency prevails, and every decade sees its new progeny.

Nevertheless, American scholars may review with satisfaction the history of their highest institutions of learning. Not one of those established in colonial days has disappeared. Two of the three oldest have made unvacillating progress, and are now first, not only in years, but in resources, comprehensiveness, and scholarship. In each successive generation they have adapted their methods to the requirements of the times, and have never been more useful, more honored, or more beloved, and never more closely studied than since 1876. Such examples are inspiring. They encourage those who are laying new foundations —perhaps in regions rescued within the last half-century from the wilderness, perhaps in States that were slow to recognize the value of higher education. If any foreign observer, if any domestic censor is inclined to point out the limitations of American universities, let him remember the words of an English don to his younger and opposing colleague: "We are none of us infallible, not even the junior fellows!" It is no disparagement of the new foundations—on the contrary, it should be to them an incitement—to recall the honest financial administration, the loyal devotion of professors to their callings, the increasing liberality of opinions, and the unfailing interest in public affairs shown from the beginning by Harvard and Yale. Even a foreigner, if he looks below the superficial, can hardly fail to discover what admirable results have followed from the voluntary principle—what generous gifts have

been made, what large incomes have been secured, what excellent libraries have been brought together, what observatories and laboratories and museums have been provided, what contributions have been made to literature and science by teachers and graduates, what excellent citizens have been trained up for the service of church and state, for the maintenance of religion and patriotism, and for the diffusion of knowledge throughout the land.

BEFORE proceeding to discuss more in detail the condition of American universities, it may not be amiss for us to pause and consider what are the legitimate functions of all universities; for amid the diversities of origin and the differences of administration it is probable that we recognize unanimously four functions that pertain to every vigorous establishment. I do not mean the maintenance of four faculties. The number of departments in a university may be numerous, or the teaching force may constitute a single faculty; or there may be a faculty of philosophy leading up to professional schools or coördinate with them, or a sharp distinction may be maintained between science and letters. These are municipal distinctions, dependent upon traditions and ideas not universally accepted; but the functions to which I refer are general.

'The first function of a university is the education of youth who have been prepared for advanced work by previous discipline in certain branches of

knowledge. Whatever else the university undertakes, it is a place where the choicest minds receive the best culture, are admitted to rare opportunities, and inspired by living examples of intellectual excellence. It is a society where thorough preparation for intellectual exertion is the condition of admission, and lofty devotion to ideals the condition of honor. The university to which no students resort, or in which the commonplaces alone are taught, is unworthy of the name. In the long run, the men who have been trained by a university are the tests of its excellence.

University education, as distinguished from collegiate, implies that its students have formed already the habits of attention, memory, discrimination, classification, judgment. Maturity of mind is requisite for the freedom implied in advanced work. This training, in our country, has usually been acquired in college; formerly it could only be there received. But high schools, academies, and private seminaries in many places are now so thorough that they have virtually taken the places which early in the century were held by the colleges; and the colleges, by raising their terms of admission, have occupied the years which might otherwise be given to university work. Consequently there is no agreement of opinion on the relative spheres of the school, the college, and the university. It would be well if Americans could agree on the proper limitations of the school and the college.

The second function of a university is the con-

servation of knowledge. This is accomplished by bringing together all the records of human experience, and by the engagement of scholars in the work of interpretation. The university should be in truth a seat of learning. Within its walls there should be comfortable stalls for those who are willing to devote their lives to the study of antiquity, whose pleasure it is to trace from their origin the language, the laws, the religions, the customs which we have inherited from our remote ancestry. There should be other chairs for those who are able to collect, arrange, describe, and interpret all natural objects which can be brought together in a museum. The fine arts, too, should have their votaries, and the best that the world has produced in architecture, sculpture, and the pictorial arts should be presented to the eyes of impressionable youth, with such instruction as will enable them to discover and appreciate the merits. Libraries and museums are the dwelling-places of universities.

The third function of a university is to extend the bounds of human knowledge. Call it research, call it investigation, call it scientific inquiry, call it the seeking for truth—never has the obligation been so strong as it is now to penetrate the arcana of the world in which we dwell, to discover new facts, to measure old phenomena, and to educe principles and laws that were written in the beginning, but have never yet been read by mortal eye. Instruments of accurate measurement and for close observation are now at command that were

unthought of in the past generation. That protean agency, the lens, has been enlarged and supplemented so that its efficiency has increased simultaneously with its adaptation to new purposes. Measurements are applied to the depths of the sea, the distances of fixed stars, the velocity of light, the intensity of electric and magnetic currents, the reactions of the nervous system; and facts which were once vagnely known become clearly and accurately understood. To the progress of observation, measurement, and experiment, universities that are worthy of the name are bound to contribute.

The fourth function of a university is to disseminate knowledge. The results of scholarly thought and acquisition are not to be treasured as secrets of a craft; they are not esoteric mysteries known only to the initiated; they are not to be recorded in cryptograms or perpetuated in private note-books. They are to be given to the world, by being imparted to colleagues and pupils, by being communicated in lectures, and especially by being put in print, and then subjected to the criticism, hospitable or inhospitable, of the entire world. That institution has a restricted sphere that is unknown beyond the circle of its own alumni. It should not claim to be a university. It is better to be the best of colleges than to be the worst of universities. Publication should not merely be in the form of learned works. The teachers of universities, at least in this country, by text-books, by lyceum lectures, by contribu-

tions to the magazines, by letters to the daily press, should diffuse the knowledge they possess. Thus are they sowers of seed which will bear fruit in future generations. One of the greatest of living naturalists has said that he was attracted to the study of natural science by the lectures of Silliman; one of the most honored of university presidents has acknowledged that a speech of Francis Wayland aroused him to a life of public service; and the philosophical educator to whom this congress owes so much has shown in a recent volume how much he was quickened by the conversation of a peripatetic from Concord. The wide-spread demand for university extension shows how intelligent persons who for one reason or another have never received the advantages of university residence are eager to get at the latest, the wisest, the most accurate instructions that can be brought within their reach. But learned publications, containing memoirs that are only meant for the scholar,—positive contributions to knowledge,—are the noblest fruits of academic culture.

These, then, are the tests of a university: the service it renders in the education of youth; its skill in the perpetuation and interpretation of the lessons of history; its endeavors to extend the domain of science; and its readiness to promote the diffusion of knowledge. Science, another name for truth, is its goal; imagination, or a vision of the ideal, is the allurement; and faith is the encouragement—faith in nature, faith in law, faith in man, faith in God.

Higher Education in the United States

In order to understand the organization of American universities, the foreign observer must be reminded of their origin. The colonists desired and established simple "colleges," corresponding closely with the colleges of Oxford and Cambridge. Harvard, Yale, Columbia, and the University of Pennsylvania belonged to this type. Upon this stem, which was firmly rooted at the beginning of the present century, professional faculties were afterward grafted. Such institutions, in their beginnings, were more or less religious foundations, and they still bear the traces of their birth.

Since the Revolution, State universities have been established, notably in the Southern States (where the University of Virginia bore the impress of Jefferson's familiarity with Continental rather than British antecedents), and subsequently in the Western States, where large amounts of public lands were set apart for their support. A third class of institutions are those which owe their existence to some great benefactor, like Cornell, Johns Hopkins, Leland Stanford, and Rockefeller, each of whom has provided an endowment and indicated more or less definitely the conditions by which the administration shall be governed.

Recently there has been a return to ecclesiastical activity. The Catholic University and the Methodist University in Washington, the Church University of the South at Sewanee, and the University Board of the Protestant Episcopal Church, are new indications of denominational zeal.

Since the civil war, institutions devoted to pure

and applied science have been successfully established, largely, though not wholly, as a consequence of the Morrill Act and its supplement. Sometimes these new foundations have been incorporated with universities, as the Sheffield School is a part of Yale University, and sometimes they have been independent institutions, like the Massachusetts Institute of Technology and the Stevens Institute in Hoboken; but in either case they must be included in any survey of higher education.

The actual workings of these five groups, however varied their origin, are very similar. Of course they are more or less perfectly developed; some have but one faculty, and some have several. That which has an income of one or two hundred thousand dollars is very different from that which annually expends a million; and two centuries or thereabouts of tradition and experience form a very different basis from a charter of to-day. Nevertheless, the family likeness is strong. Our educational institutions are decidedly American. Not one of them can be or would be a German or an English or a Scotch or an Irish university. Suggestions, ideas, are welcomed as germs from other lands, but the plants grow up in our own soil and are the result of our laws, traditions, and wishes; they are like the vines of California, which bear the old names, but produce a vintage with flavors of its own, not yet familiar to European palates, but pleasant and wholesome.

In all these institutions the idea of liberal education has been preserved. The best of the tech-

nical schools provide generously for instruction in languages, and most of them for instruction in abstract science as well as in its practical application. The traditional notion of a college training antecedent to professional courses, and preliminary to advanced work, holds its own; and, indeed, it seems to gain support by the emphasis that is given to the dividing-line between undergraduates and postgraduates. There are many open questions as to the period of life which should be allotted to college studies, the proper terms of admission and graduation, and the adjustment of freedom in the choice of studies with the obligation to choose wisely. But amid all the dissensions upon minor points, it is clear that the love of college life is growing; its methods are improving, and its relation to professional and technical pursuits and to careers in science and literature is more and more clear.

THERE are many unsolved problems in respect to university education in this country to which we may well direct our attention. Among them I mention, first, the establishment of a university in the Federal City. The opinions upon this subject may thus be grouped: There are those who advocate the endowment of a national university by the government, and consequently its administration by such boards as the government may institute. In support of this principle, eminent authorities may be quoted from Washington to our own contemporaries. This view is vehemently

opposed by those who dread the enlistment of Congress in services which, it is claimed, pertain to the separate States and to private individuals. Meanwhile the Catholics and the Methodists have initiated universities and are acquiring the requisite funds for their maintenance. Other religious bodies are likely to follow their example, and it is not impossible that there will soon be a group of institutions in Washington representing the principal Christian sects. There are those who claim, with much force, that the charter of the Columbian University would be an excellent basis for a national institution, and that money alone is requisite in order to secure the highest efficiency. Still, again, there are those who believe that an independent foundation by private donations will be more successful than any form of political or ecclesiastical endowment. Perhaps the problem would be simplified if the idea could be eliminated that a university in Washington must of course be a place for the systematic education of youth and for the bestowal of academic degrees. This is, indeed, a usual function of American universities, but it is not essential. If the university in Washington could be so ordered that all the scientific resources of the nation were available for study, under the guidance of competent persons, without reference to honors, and without formal and prolonged curricula, very many well-qualified scholars—some who have graduated and some who have never been in college; men and women; foreigners and Americans; some in early and some in

later life—would there be gathered, and would be aided, taught, inspired by the opportunities and influences thrown open to them, in an amplitude worthy of the national capital.

The last word has not been said in respect to the higher education of women. Three views are prevalent. At one extreme are those who would not open the doors of any high school on the same terms to men and women. They believe that the sexes can be taught in a better way in separate institutions. They believe that, through a series of influences extending over many centuries, women in civilized countries—certainly in circles where refinement, education, and religion are prevalent—have been protected from the harsher and rougher influences of the world, and have been relieved from burdens which their fathers, brothers, husbands, and sons have been, as a rule, most willing to bear. To those who dwell upon this aspect of the question, absolute co-education seems to be a retrograde step. It may, however, be conceded that ere long, perhaps henceforward, women are to have equal advantages with men in the pursuit of advanced education though not necessarily the same; and it is certainly demonstrated that their powers of acquiring knowledge are equal to those of men.

At the opposite extreme are those who claim that women will equal men, if they have an opportunity, in the professions of law, medicine, and theology, and in scientific and literary pursuits; that many are now prepared for and eager for university

opportunities; and that it would be a waste of force, even if it were practicable at the moment, to duplicate such foundations as are open to men. To those who hold these opinions, co-education seems essential.

Between these extremes another view is held. The intermediates would open to both sexes the advantages of university instruction, but would do so under such arrangements as will secure to women the supervision and counsel of women, as to men the supervision and counsel of men. The experience acquired in the colleges for women associated with the universities of Cambridge and Oxford, and in our own country the remarkable success which has attended what is called the Annex of Harvard University,[1] indicate to many the true solution of the problem; unless, indeed, around such a foundation as Bryn Mawr or another woman's college the not impossible nor undesirable university for women should be developed.

In comparison with the subjects already named, it may seem that the question of residence in a university is of very slight importance; but is this true in places where the education of youth, the development of character, and the formation of moral, mental, and social habits are deemed of prime importance? Poverty, indifference, and inattention seem to have governed our usages hitherto. The original colleges brought hither from England the notions of a master's residence, a chapel, a common dining-hall, and lodgings over

[1] Now Radcliffe College

which the tutors exercised some supervision—arrangements which fascinate every visitor upon the Isis and the Cam. But for some reason these usages degenerated in this country. The halls of residence have become "dormitories," open to the outside world by night and by day, without any tables or refectories. Commons were so badly managed that bread-and-butter rebellions were sometimes resorted to for relief, and commons were given up. The reaction has begun, certainly at Harvard and Yale. The evils that were attributed to dormitories, rightly or wrongly, led many of the newer institutions to abandon their use, or to refrain from introducing them. In recent times, in many places, fraternities supply their members with the comforts of private houses. In many places there is no such general provision. One experiment remains to be tried: the establishment of a hall of residence which shall be to the university what a college is to Oxford and Cambridge, a hotel, with a scholar and his staff at the head of it; with privacy, comfort, oversight, and intellectual guidance; where visitors may be received and entertainments may be given, but where the dominant pursuit is study, the society restricted to men of intellectual pursuits. Probably the next stage in the development of college residences will be a modern home for students, with many of those charms which made conventual and subsequently collegiate life attractive, but with modern sanitary improvements, and modern comforts of a substantial but not of an extravagant character.

In the future some dangers are apparent. The spirit of rivalry, sometimes latent, sometimes avowed, threatens to restrict the usefulness of our higher institutions. These powerful agencies for good should maintain their solidarity, solidarity of purpose and of influence, solidarity in the discovery, maintenance, and diffusion of the truth; for the fields of research are as infinite as the heavens above, the needs of human society are as varied as the lessons of human experience, and the youth qualified to profit by higher educations are more numerous than the throngs who frequented the lectures of Abélard and the schoolmen, before the discoveries of Faust and Schöffer. In every aspect of the harvest there is enough and to spare. It is, therefore, as needless as it is foolish to engage in such rivalries as ought to be restricted, with the use of sensational advertisements, to the venders of patent medicine and the managers of dime museums. When all our strong universities do their utmost, the work of education and of investigation will only be half done.

There is reason to fear that the distinctive "college" will be disprized, as technical schools increase in numbers and in excellence, as professional schools show their readiness to fill up their benches with scholars who have never had a proper preparation, and as permission is granted to anticipate during an undergraduate course those studies which are properly reserved for those who have taken their first degree in arts. The tendency to undervalue the American college

is also shown by a disposition to offer graduate, advanced, or university courses in places where the forces are only equal, perhaps are barely equal, to the work of a college. The most critical questions respecting higher education are now to be found in the college domain. I can only state them, leaving their discussion to others. What are the proper conditions of admission? Has it been wise to increase the requirements, so that the ages of college students at entrance are now almost synchronous with the age at graduation in the early part of this century? By what method can the elective system be so regulated that every student shall be rightly guided in his choice? Ought not greater emphasis be given to the old idea of a liberal education intermediate between that of the preparatory school and that of professional and technical schools?

In respect to publications, there is this cause for complaint: Within the last few years scores of new journals have been begun, bearing the names of the institutions in which they are issued. Many of them have a very limited circulation. Articles of merit which appear in their pages are in danger of the greatest of horrors—burial alive. They are only printed, not published. Many of them occupy the field of other journals elsewhere published. There are no general indexes or reviews or yearbooks which collate the contents. It is extravagant for individuals, it is troublesome for libraries, to take in all these journals. Where they are received, they are liable to remain unread, perhaps

uncut. All this belongs to the exuberance of adolescence. There must be a survival of the fittest. Various schemes have been proposed for the accomplishment of a reform, but they are too detailed for discussion here. However, it may not be deemed discourteous to assert this thesis, that an institution does not win so much distinction from serials bearing its name as it derives from the memoirs, essays, and contributions to science or to literature produced by its faculty, which are read and acknowledged by the leading authorities at home and abroad. A scholar in the most obscure village in the country may light a candle or discover a jewel which will give him position everywhere; but he must put his candle in a candlestick, and his jewel must be mounted that it may be seen. He must not merely print; he must publish.

But the prospect of dangers does not detract from the pleasures and excitements of the voyage, or from the belief that there are regions rich in gold and wheat, in ivory and peacocks, yet to be visited by our caravels in lands beyond the sea. The universities and colleges of this country are the hope of our future. Those who profit by their advantages, as a rule, will be found taking the right attitude toward all public questions. The more liberal their education and the more wise their teachers, the surer are they to be found on the side of liberty and good government, the more steady will be their resistance to that conservatism

which is afraid of progress, and to that radicalism which heeds not the voice of history. / The day will come, if it has not already dawned, when professors of law will be taken from our universities for arbitration and counsel in questions affecting the peace of nations; when men of letters, or at least of academic culture, will be sent, as the best representatives of the American people, to the most cultivated courts of Europe; when the students of finance will be asked to leave their chairs of instruction and assist the officers of government in disentangling fiscal problems; when the missionary, trained by his linguistic discipline for the mastery of oriental tongues, shall become the interpreter and introducer of Western ideas into Eastern countries; when men of science will be more and more relied on in the solution of the world-problems pertaining to life and force; when philologians will interpret the texts upon which theologians will base their creeds; when the daily press will more and more readily open its columns to the matured opinions given out by learned men; when the barriers (slight and transitory barriers, we may well believe) which have grown up between the common schools and the universities will disappear from every part of the country; and when knowledge, accurate, scientific, comprehensive knowledge, will be regarded not only for its own sake, but as the parent of wisdom and virtue. Am I speaking of the future or of the present? Has not the day of universities dawned? Have not our higher insti-

tutions won that position that entitles them to the confidence, the admiration, and the support of all the American people? These five contributions they will make to our civilization: science will take the place of empiricism; the power of sustained effort will be augmented; good government will be established; encouragement will be provided for men of rare intellectual qualities; and the noble enjoyment of leisure will be assured.

THE PROPOSALS FOR A NATIONAL UNIVERSITY IN WASHINGTON

AN OPEN LETTER

PRINTED IN THE "CENTURY MAGAZINE," 1897

The following letter was written in response to a request for an opinion as to the possibility of establishing in Washington a national university.

THE PROPOSALS FOR A NATIONAL UNIVERSITY IN WASHINGTON

THE agitation that has been vigorously carried on by the Hon. John D. Hoyt during the last few years has awakened a great deal of interest in the possibility of establishing a national university in Washington. Clear and ample statements have been put forth respecting the intellectual attractions of the capital. The development of the idea from the days of George Washington until the present has been carefully studied. A large number of persons, more or less engaged in the advancement of higher education, have expressed their sentiments with more or less emphasis; and a small committee, including several gentlemen of the highest distinction, have consented to act as a body of promoters. A bill has been drafted, circulated, modified, and presented for the consideration of Congress, and it has passed the first stages of senatorial legislation. Now comes a halt.

Three things have been demonstrated by this agitation.

First, there is a strong desire, not only among the residents of the Federal City, but among the lovers and promoters of learning throughout the country, that the libraries, collections, instruments, and apparatus belonging to the government should be opened to students, not as a favor, nor by exception, nor as a passing entertainment, but for study and experiment, according to suitable regulations, and especially under the guidance of such able teachers as may be already engaged in the service of the government, or may be enlisted hereafter for the particular offices of education. So far as this there would be an unanimous, or nearly unanimous, assent.

Second, the universities existing in Washington and near to it, including those of New England, would regard with disfavor, and probably with distrust, an effort to establish, by congressional action, the University of the United States. In some places there would be positive opposition. Already the capital has the old Columbian University, with its liberal charter, its buildings and funds, its faculty and alumni; the Georgetown University, likewise vigorous; the Catholic University, which has sprung with a bound, under the direct patronage of the Pope, into a position of great distinction and influence; the Methodist University, which is not likely to drag, if a strong, wide-spread, and popular religious denomination can be relied upon; and the Howard University,

devoted to the interests of the colored race. At the distance of an hour's ride the Johns Hopkins University offers the advantages of libraries, laboratories, and teachers of renown. What will any one of these institutions say, what will be the force of their collective opposition, if another aspirant is placed in the field? What will Pennsylvania, Columbia, Princeton, Yale, and Harvard say when the issue is finally made up? What will be the attitude of Ithaca, Ann Arbor, Chicago, Evanston, Minneapolis, and other Western seats of learning, if the bounty of the United States draws off their faculties and their students?

Third, outside of academic circles, as well as inside, there is a great distrust of the principle that Congress should provide for and direct university education. The fears may be foolish; it is easy to laugh at them. Apprehensions may be pronounced groundless; nevertheless, it will be difficult to get rid of them. There will be an ever-present expectation of political interference, first in the governing body, then in the faculty, and finally in the subjects and methods of instruction. It is true that partizan entanglement may be avoided, but it will be difficult indeed to escape the thraldom.

Is it possible to reconcile the conflicting views? Can the natural and wide-spread desire to participate in the intellectual resources of the capital be gratified without awakening the antagonism of the universities already established, and without involving congressional control or political interference?

There is a way—not a way of compromise, but of combination.

The Smithsonian Institution was founded "for the advancement and diffusion of knowledge." It has an admirable, an unblemished record of more than half a century. It is under the patronage of the government, and it is managed by a board of regents selected for their wisdom, character, and public spirit, and for their interest in the progress of literature and science. They have never shown any ecclesiastical, partizan, or sectional bias. They have never encountered the ill will of the public. They have received generous gifts from individuals. They have administered their funds with economy and prudence. They have always been progressive. Each successive administration has adapted its plans and methods to the demands of the times.

The first secretary began the publication of learned memoirs which might not otherwise see the light; he encouraged the study of American antiquities and aborigines; he promoted international exchanges of books and journals; he initiated the plan of weather observations that has grown into the actual Weather Bureau. The second secretary developed two great institutions, the United States Fish Commission and the National Museum, each the offspring of the Smithsonian. The third secretary has established the Zoölogical Gardens, has carried on fundamental inquiries into the nature of light, and has made such important researches respecting aërial locomotion that the "flying-machine" is already here.

University in Washington

Now let the Smithsonian take another step forward. Let it organize a plan by which the literary and scientific institutions of Washington may be associated and correlated so far, and so far only, as relates to the instruction and assistance, under proper restrictions, of qualified students. If a plan can be set forth upon which these institutions are agreed, the funds for its support will be forthcoming. Costly buildings are not necessary. The current expenses will not be large. The same liberality which has hitherto promoted the Smithsonian will certainly be continued. At any rate, an experiment will not be expensive.

The outlines of such a plan may now be indicated as a basis for further suggestions. To begin with, a head of this branch of service must be announced. This may well be the secretary; but if he is already too much occupied, let there be an assistant secretary in charge of advanced instruction and research. He must be the organizing and administrative officer. Next the inventory, already published, of the literary and scientific resources of Washington must be reëxamined, and the conditions on which these resources may be opened must be clearly stated. A certain number of teachers must be enlisted who will give, for proper emolument, instruction and guidance in their specialties. There should be no attempt to provide a general or liberal course of education, but only opportunities and encouragement for the prosecution of certain specific courses. Consequently there will be no curriculum, no public examina-

tions, no degrees. On the other hand, there must be abundant opportunities. Any person of either sex, from any place, of whatever age, without any questions as to his previous academic degree, should be admissible; provided, however, that he demonstrate his fitness to the satisfaction of the leader in the subject of his predilection. Evidence of preparation in one department will be totally different from that required in another.

Of course the objection will be made that this is "not a university." Is it not? What is a university? Etymologically and originally, a university was simply an association, a society, a corporation. It might be for almost any dignified purpose. Gradually the term was restricted to a society of scholars. *Societas magistrorum et discipulorum* (the union of masters and pupils) is all that is essential to the idea of a university.

Such a learned society may be developed more readily around the Smithsonian Institution, with less friction, less expense, less peril, and with the prospect of more permanent and wide-spread advantages to the country than by a dozen denominational seminaries or one colossal University of the United States.

To the special opportunities that the Smithsonian and its affiliations could offer, every university, at a distance or near by, might be glad to send its most promising students for a residence of weeks, months, or years, never losing control of them. Many other persons, disconnected with universities, but proficient to a considerable degree in one

study or another, would also resort with pleasure and gratitude, and with prospect of great advantages, to the rare opportunities which Washington affords for study and investigation in history, political science, literature, ethnology, anthropology, medicine, agriculture, meteorology, geology, geodesy, and astronomy.

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